

InterLab[®]

RF Exposure and Maximum ERP/EIRP Assessment

For

SARA-R410M-02B

FCC ID: XPY2AGQN4NNN

IC: 8595A-2AGQN4NNN

Assessment Reference: MDE_UBLOX_1907_SARA-R410M-02B_MPE

Test Laboratory:

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Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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0 Summary

0.1 Technical Report Summary

Type of Report

RF Exposure and Maximum ERP/EIRP Assessment for a UMTS/LTE radio module. Including RF Exposure for use with co-located radios on generic host device.

Applicable FCC and IC Rules

For RF Exposure:

OET Bulletin 65 Edition 97-01 August 1997

FCC 47 CFR §1.1307

FCC 47 CFR §1.1310

RSS-102 Issue 5 – March 2015

For Maximum ERP/EIRP:

FCC 47 CFR §22.913

IC SRSP-503 Issue 7, September 2008

FCC 47 CFR §24.232

IC SRSP-510 Issue 5, February 2009

FCC 47 CFR §27.50(d)

RSS-139, Issue 2 / SRSP-513, July 2015

Report version control			
Rev Version	Release date	Changes	Version validity
MPE	2019.04.04	Initial version	Valid

Responsible for
Accreditation Scope*:



Responsible
for Report:



*ERP/EIRP Measurement



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1 Administrative Data

1.1 Testing Laboratory

Company Name: 7 Layers GmbH

Address Borsigstr. 11
40880 Ratingen
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This facility has been fully described in a report submitted to the FCC and IC and accepted under the registration number 96716 and IC 3699A-1.

The test facility is also accredited by the following accreditation organisation:
Laboratory accreditation no.: DAkKS D-PL-12140-01-00

Responsible for Accreditation Scope: Dipl.-Ing. Bernhard Retka
Dipl.-Ing. Robert Machulec
Dipl.-Ing. Andreas Petz
Dipl.-Ing. Marco Kullik

Report Template Version: 08-02-2017

1.2 Project Data

Responsible for assessment and report: Mr. Roseelan Sathiyaseelan

Date of Report: 04-04-2019

1.3 Applicant Data

Company Name: u-blox AG

Address: Zürcherstrasse 68,
CH-8800 Thalwil
Switzerland

Contact Person: Giulio Comar

1.4 Manufacturer Data

Company Name: please see applicant data

Address: please see applicant data

Contact Person: please see applicant data

2 Test object Data

2.1 General EUT Description

Equipment under Test	SARA-R410M-02B
Type Designation:	SARA-R410M-02B
Kind of Device:	CATM1/NB-IOT
FCC ID:	FCC ID: XPY2AGQN4NNN
IC Number:	IC: 8595A-2AGQN4NNN

General product description:

The EUT is a low power device supporting CatM1 and NB-IOT.

2.2 EUT Main components

Type, S/N, Short Descriptions etc. used in this Test Report

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status
EUT B (Code: DE1015106ab01)	SARAR410M-02B	SARA-R410M-02B	352753094745070	306A06	L0.0.00.00.05.06
Remark: EUT A, B and D are equipped with a temporary antenna connector. The Modules are not sold with a predefined antenna.					

NOTE: EUT A and EUT D have been used for all supported frequency bands except FDD5, eFDD5 and eFDD7. EUT B has been used for frequency band FDD5, eFDD5 and eFDD7 only.

2.3 Ancillary Equipment

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	HW Status	SW Status	Serial no.	FCC ID
AE 1	AC/DC converter	UUX324-1215	-	-	E09-0291981	-
AE 2	Evaluation test board	EVW-WL3	NO_EVK_CS_191A00	-	-	-

2.4 Auxiliary Equipment

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Auxiliary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	Serial no.	HW Status	SW Status	FCC ID
N/A						—

3 Evaluation Results

3.1 Maximum ERP / EIRP

Standard	Frequency Band
FCC 47 CFR §22.913 IC RSS-132, Issue 3	-
FCC 47 CFR §24.232 IC RSS-133 Issue 6	Band 25
FCC 47 CFR §27.50(d) RSS-139, Issue 2 / SRSP-513	-

3.1.1 Test Limits

For the 850MHz band, FCC §22.913 states that the maximum ERP of this device shall not exceed 7 Watts. IC SRSP-503 Issue 7, states that this device shall not exceed a maximum EIRP of 11.5 Watts
For the purposes of this test report, the 7 Watt ERP limit stipulated in FCC §22.913 has been converted to an equivalent ERIP value of 11.5 Watts.

For all other limits, refer to the values stipulated in the corresponding tables.

3.1.2 Test Protocol

Maximum antenna gain to comply with EIRP limits for FCC and Industry Canada

Band	Mode	Duty Cycle (%)	Frequency (MHZ)	Maximum Conducted output power (dBm)	Maximum Conducted output power (mW)	Freq of highest power	FCC EIRP limit (mW)	Maximum antenna gain to meet EIRP Limit (dBi)
eFDD25	LTE	100.0%	2305-2315	22.57	180.71741	1882.50	4922	14.4

3.1.3 Conclusion

Band	Max gain to be used to comply with EIRP Limits	Max gain to be used to comply with FCC MPE Limits	Max gain to be used to comply with IC MPE Limits	Maximum gain to be compliant with all limits
eFDD25	14.4	13.8	9.4	9.4

The above table lists the gains which conform to both the EIRP limits and the MPE limits for both IC and FCC. Gain expressed in dBi.

3.2 RF Exposure Evaluation for Module

Standards
OET Bulletin 65 Edition 97-01 August 1997
FCC 47 CFR §1.1307
FCC 47 CFR §1.1310
RSS-102 Issue 5 – March 2015

3.2.1 Test limits

As specified in Table 1B of 47 CFR 1.1310 – Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure.

Frequency range (MHz)	Power density (mW/cm ²)
300 – 1,500	f/1500
1,500 – 100,000	1.0

Limits specified per RSS-102, Issue 5.

Frequency range (MHz)	Power density (W/m ²)	Power density (mW/cm ²)
300 – 6000	0.02619 $f^{0.6834}$	mW/cm ² = W/m ² * 0.1

Equation OET bulletin 65, page 18, edition 97-01:
$$S = \frac{PG}{4\pi R^2} = \frac{EIRP}{4\pi R^2}$$

Where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the centre of radiation of the antenna

3.2.2 Test Protocol

Maximum antenna gain to comply with MPE limits for Industry Canada

Band	Mode	Duty Cycle	Frequency (MHz)	Maximum Conducted output power (dBm)	Maximum Conducted output power (mW)	Equivalent conducted output power (mW)	MPE Limit (mW/cm ²)	Maximum antenna gain to meet MPE Limit (dBi)	Separation distance (cm)
eFDD25	LTE	100%	1882.5	25.0	316.23	316.23	0.4530	9.4	22

* Conducted output power values bases on “Tune-up” information provided by manufacture

Maximum antenna gain to comply with MPE limits for FCC

Band	Mode	Duty Cycle	Frequency (MHz)	Maximum Conducted output power (dBm)	Maximum Conducted output power (mW)	Equivalent conducted output power (mW)	MPE Limit (mW/cm ²)	Maximum antenna gain to meet MPE Limit (dBi)	Separation distance (cm)
eFDD25	LTE	100.0%	1882.5	25	316.23	316.23	1.2550	13.8	22

* Conducted output power values bases on “Tune-up” information provided by manufacturer.

3.2.3 Conclusion

Band	Max gain for FCC MPE Limits	Max gain for Industry Canada MPE Limits	Maximum gain to be compliant with all limits
eFDD25	13.8	9.4	9.4

Gain expressed in dBi