

RF EXPOSURE EVALUATION REPORT

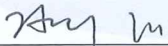
Product Name: Global LTE Cat.M1/LTE Cat.NB2/2G
Data-Only Module
Trade Mark: CINTERION
Model No. / HVIN: EXS82-W
Report Number: 191019004RFC-1
Test Standards: FCC 47 CFR Part 1 Subpart I
RSS-102 Issue 5
FCC ID: QIPEXS82-W
IC: 7830A-EXS82W
Test Result: PASS
Date of Issue: December 21, 2019

Prepared for:

Gemalto M2M GmbH
Siemensdamm 50 Berlin, 13629 Germany

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
16/F, Block A, Building 6, Baoneng Science and Technology Park,
Qingxiang Road No.1, Longhua New District, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Prepared by: 
Henry Lu
Team Leader

Reviewed by: 
Kevin Liang
Assistant Manager

Approved by: 
Billy Li
Technical Director

Date: December 21, 2019

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Version

Version No.	Date	Description
V1.0	December 21, 2019	Original

**Shenzhen UnionTrust Quality and Technology Co., Ltd.**

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com<http://www.uttlab.com>UTTR-RF-RSS102-V1.0

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Gemalto M2M GmbH
Address of Applicant:	Siemensdamm 50 Berlin, 13629 Germany
Manufacturer:	Gemalto M2M GmbH
Address of Manufacturer:	Siemensdamm 50 Berlin, 13629 Germany

1.2 EUT INFORMATION

Product Name:	Global LTE Cat.M1/LTE Cat.NB2/2G Data-Only Module	
Model No. / HVIN:	EXS82-W(See Note)	
Trade Mark:	CINTERION	
DUT Stage:	Identical Prototype	
EUT Supports Function:	GSM Bands:	GSM850/1900
	E-UTRA Bands:	Band 2/ Band 4/ Band 5/ Band 12/ Band 13/ Band 25/ Band 26/ Band 66/ Band 71
Sample Received Date:	September 19, 2019	
Sample Tested Date:	September 19, 2019 to December 2, 2019	
Note: This product EXS82-W has two forms of SIM and ESIM.		

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Support Networks:	GPRS	
Type of Modulation:	GPRS:	GMSK
Frequency Range:	GPRS 850:	824.2-848.8 MHz
	GPRS 1900:	1850.2-1909.8 MHz
Max RF Output Power:	GPRS 850:	35.84dBm
	GPRS 1900:	28.51dBm
Antenna Type:	External Antenna	
Antenna Gain:	GSM 850:	5.17 dBi
	PCS 1900:	2.17 dBi
GPRS Class:	Class 10	

Support Networks:	LTE	
Type of Modulation:	LTE Band 2/4/5/12/13/25/26/66/71:	BPSK,QPSK
Category	NB1	
Deployment	stand-alone	
Sub-carrier spacing	3.75KHz, 15KHz	
Ntones	single, multi-tone	
Antenna Type:	External Antenna	
Antenna Gain:	LTE Band 2:	2.17 dBi
	LTE Band 4:	2.17 dBi
	LTE Band 5:	5.17 dBi
	LTE Band 12:	3.17 dBi
	LTE Band 13:	3.17 dBi
	LTE Band 25:	2.17 dBi
	LTE Band 26:	5.17 dBi

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	LTE Band 66:	2.17 dBi
	LTE Band 71:	3.17 dBi

Support Networks:	LTE	
Type of Modulation:	LTE Band 2/4/5/12/13/25/26/66/71:	QPSK, 16QAM
Category	CAT M	
Antenna Type:	External Antenna	
Antenna Gain:	LTE Band 2:	2.17 dBi
	LTE Band 4:	2.17 dBi
	LTE Band 5:	5.17 dBi
	LTE Band 12:	3.17 dBi
	LTE Band 13:	3.17 dBi
	LTE Band 25:	2.17 dBi
	LTE Band 26:	5.17 dBi
	LTE Band 66:	2.17 dBi

1.4 OTHER INFORMATION

Bands	Tx/Rx Frequency	RF Channel		
		Low(L)	Middle(M)	High(H)
GPRS/ 850	Tx (824 MHz ~ 849 MHz)	Channel 128	Channel 190	Channel 251
		824.2 MHz	836.6 MHz	848.8 MHz

Bands	Tx/Rx Frequency	RF Channel		
		Low(L)	Middle(M)	High(H)
GPRS/ 1900	Tx (1850 MHz-1910 MHz)	Channel 512	Channel 661	Channel 810
		1850.2 MHz	1880.0 MHz	1909.8 MHz

Band	Test Frequency ID	Bandwidth (MHz)	Number [UL]	Frequency of Uplink (MHz)
LTE Band 2 TX: 1850-1910MHz	Low Range	1.4	18607	1850.7
		3	18615	1851.5
		5	18625	1852.5
		10	18650	1855
		15	18675	1857.5
		20	18700	1860
	Middle Range	1.4/3/5/10/15/20	18900	1880
	High Range	1.4	19193	1909.3
		3	19185	1908.5
		5	19175	1907.5
		10	19150	1905
		15	19125	1902.5
		20	19100	1900
LTE Band 4 TX: 1710-1755MHz	Low Range	1.4	19957	1710.7
		3	19965	1711.5
		5	19975	1712.5
		10	20000	1715

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		15	20025	1717.5
		20	20050	1720
	Middle Range	1.4/3/5/10/ 15/20	20175	1732.5
	High Range	1.4	20393	1754.3
		3	20385	1753.5
		5	20375	1752.5
		10	20350	1750
		15	20325	1747.5
20	20300	1745		
LTE band 5 TX: 824–849MHz	Low Range	1.4	20407	824.7
		3	20415	825.5
		5	20425	826.5
		10	20450	829
	Middle Range	1.4/3/5/10	20525	836.5
	High Range	1.4	20643	848.3
		3	20635	847.5
		5	20625	846.5
10		20600	844	
LTE Band 12 TX: 699-716MHz	Low Range	1.4	23017	699.7
		3	23025	700.5
		5	23035	701.5
		10	23060	704
	Middle Range	1.4/3/5/10	23095	707.5
	High Range	1.4	23173	715.3
		3	23165	714.5
		5	23155	713.5
10		23130	711	
LTE Band 13 TX: 777-787MHz	Low Range	5	23205	779.5
		10	23230	782
	Middle Range	5/10	23230	782
	High Range	5	23255	784.5
10		23230	782	
LTE Band 25 TX: 1850-1915MHz	Low Range	1.4	26047	1850.7
		3	26055	1851.5
		5	26065	1852.5
		10	26090	1855
		15	26115	1857.5
		20	26140	1860
	Middle Range	1.4/3/5/10/15/20	26340	1880
	High Range	1.4	26683	1914.3
		3	26675	1913.5
		5	26665	1912.5
		10	26640	1910
		15	26615	1907.5
20		26590	1905	
LTE band 26	Low Range	1.4	26797	824.7

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TX:824-849MHz		3	26805	825.5
		5	26815	826.5
		10	26840	829
		15	26865	831.5
	Middle Range	1.4/3/5/10/15	26915	836.5
	High Range	1.4	27033	848.3
		3	27025	847.5
		5	27015	846.5
		10	26990	844
15		26965	841.5	
LTE band 26 TX: 814-824MHz	Low Range	1.4	26697	814.7
		3	26705	815.5
		5	26715	816.5
		10	/	/
		15	26765	821.5
	Middle Range	1.4/3/5/10	26740	819
	High Range	1.4	26783	823.3
		3	26775	822.5
		5	26765	821.5
10		/	/	
15	/	/		
LTE Band 66 TX: 1710-1780MHz	Low Range	1.4	131979	1710.7
		3	131987	1711.5
		5	131997	1712.5
		10	132022	1715
		15	132047	1717.5
		20	132072	1720
	Middle Range	1.4/3/5/10/ 15/20	132322	1745
	High Range	1.4	132665	1779.3
		3	132657	1778.5
		5	132647	1777.5
		10	132622	1775
		15	132597	1772.5
		20	132572	1770
20		132572	1770	
LTE Band 71 TX: 663-698MHz	Low Range	5	133147	665.5
		10	133172	668
		15	133197	670.5
		20	133222	673
	Middle Range	5/10/15	133297	680.5
		20	133322	683
	High Range	5	133447	695.5
		10	133422	693
		15	133397	690.5
		20	133372	688

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1.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC 47 CFR Part 1 Subpart I
RSS-102 Issue 5

All test items have been performed and recorded as per the above standards

1.6 DEVIATION FROM STANDARDS

None.

1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

2. EQUIPMENT LIST

Please refer to the RF test report.

3. MPE EVALUATION

3.1 REFERENCE DOCUMENTS FOR EVALUATION

No.	Identity	Document Title
1	FCC 47 CFR Part 1 Subpart I	PROCEDURES IMPLEMENTING THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969
2	RSS-102 Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
3	KDB 447498 D01 General RF Exposure Guidance v06	RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES

3.2 MPE COMPLIANCE REQUIREMENT

3.2.1 Limits

3.2.1.1 FCC 47 CFR Part 1 Subpart I

According to §1.1307(b)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Limits for Occupational / Controlled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	F/300	6
1500-100000	/	/	5	6

Limits for General Population / Uncontrolled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-100000	/	/	1	30

Note: f = frequency in MHz: * = Plane-wave equivalent power density.

3.2.1.2 RSS-102 Issue 5

According to RSS-102 Issue 5, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

According to RSS-102 Issue 5, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz⁶ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

3.2.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

3.3 MPE CALCULATION METHOD

FCC 47 CFR Part 1 Subpart I

$$S = PG/4\pi R^2 = EIRP/4\pi R^2$$

S = power density (in appropriate units, e.g., mw/cm²)

P = power input to the antenna (in appropriate units, e.g., mw)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor is normally numeric gain.

R = distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

3.4 MPE CALCULATION RESULTS

Note: For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

3.4.1 Results for FCC 47 CFR Part 1 Subpart I

For GPRS

Operating Mode	Freq.	Declared maximum conducted average output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Duty cycle	Declared maximum EIRP	MPE Limit	MPE Value
	(MHz)								
GPRS 850	824 ~ 849	35	1	5.17	36	12	477.7286	0.5495	0.7920
GPRS 1900	1850~1910	28	1	2.17	29	12	95.3194	1	0.1580

For LTE CAT M

Operating Mode	Freq.	Declared maximum conducted average output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Duty cycle	Declared maximum EIRP	MPE Limit	MPE Value
	(MHz)								
Band 2	1850-1910	23	1	2.17	24	100	251.1886	1	0.0500
Band 4	1710-1755	23	1	2.17	24	100	251.1886	1	0.0500
Band 5	824~849	24	1	5.17	25	100	316.2278	0.5498	0.0629
Band 12	699-716	21	2	3.17	23	100	199.5262	0.4665	0.0397
Band 13	777-787	22	1	3.17	23	100	199.5262	0.5197	0.0397
Band 25	1850-1915	23	1	2.17	24	100	251.1886	1	0.0500
Band 26	824~849	23	2	5.17	25	100	316.2278	0.5498	0.0629
Band 26 (PART 90S)	814-824	23	2	5.17	25	100	316.2278	0.5431	0.0629
Band 66	1710-1780	23	1	2.17	24	100	251.1886	1	0.0500

For LTE NB IOT

Operating Mode	Freq.	Declared maximum conducted average output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Duty cycle	Declared maximum EIRP	MPE Limit	MPE Value
	(MHz)								
Band 2	1850-1910	23	1	2.17	24	100	251.1886	1	0.0500
Band 4	1710-1755	23	1	2.17	24	100	251.1886	1	0.0500
Band 5	824~849	24	1	5.17	25	100	316.2278	0.5498	0.0629
Band 12	699-716	21	2	3.17	23	100	199.5262	0.4665	0.0397
Band 13	777-787	22	1	3.17	23	100	199.5262	0.5197	0.0397
Band 25	1850-1915	23	1	2.17	24	100	251.1886	1	0.0500
Band 26	824~849	23	2	5.17	25	100	316.2278	0.5498	0.0629
Band 26 (PART 90S)	814-824	23	2	5.17	25	100	316.2278	0.5431	0.0629
Band 66	1710-1780	23	1	2.17	24	100	251.1886	1	0.0500
Band 71	663~698	22	1	3.17	23	100	199.5262	0.4437	0.0397

3.4.2 Results for RSS-102 Issue 5

For GPRS

Operating Mode	Freq.	Declared maximum conducted average output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Duty cycle	Declared maximum EIRP	Limit
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(%)	(W)	(W)
GPRS 850	824 ~ 849	35	1	5.17	36	12	0.4777	1.2885
GPRS 1900	1850~1910	28	1	2.17	29	12	0.0953	2.2392

For LTE CAT M

Operating Mode	Freq.	Declared maximum conducted average output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Duty cycle	Declared maximum EIRP	Limit
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(%)	(W)	(W)
Band 2	1850-1910	23	1	2.17	24	100	0.2512	2.2396
Band 4	1710-1755	23	1	2.17	24	100	0.2512	2.1224
Band 5	824~849	24	1	5.17	25	100	0.3162	1.2890
Band 12	699-716	21	2	3.17	23	100	0.1995	1.1521
Band 13	777-787	22	1	3.17	23	100	0.1995	1.2403
Band 25	1850-1915	23	1	2.17	24	100	0.2512	2.2396
Band 66	1710-1780	23	1	2.17	24	100	0.2512	2.1224

For LTE NB-IOT

Operating Mode	Freq.	Declared maximum conducted average output power	Max. positive tolerance according manufacturer	Antenna Gain	Calculated maximum EIRP	Duty cycle	Declared maximum EIRP	Limit
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	(%)	(W)	(W)
Band 2	1850-1910	23	1	2.17	24	100	0.2512	2.2396
Band 4	1710-1755	23	1	2.17	24	100	0.2512	2.1224
Band 5	824~849	24	1	5.17	25	100	0.3162	1.2890
Band 12	699-716	21	2	3.17	23	100	0.1995	1.1521
Band 13	777-787	22	1	3.17	23	100	0.1995	1.2403
Band 25	1850-1915	23	1	2.17	24	100	0.2512	2.2396
Band 66	1710-1780	23	1	2.17	24	100	0.2512	2.1224
Band 71	663~698	22	1	3.17	23	100	0.1995	1.1133

APPENDIX 1 PHOTOS OF TEST SETUP

N/A

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal Photos.

*** End of Report ***

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.
