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Report No.: SZEM180400321703

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RF Exposure Evaluation Report

Application No.: SZEM1804003217RG
Applicant: Fibocom Wireless Inc.
Address of Applicant: 5/F, Tower A, Technology Building II, 1057 Nanhai Avenue, Shenzhen, China
Manufacturer: Fibocom Wireless Inc.
Address of Manufacturer: 5/F, Tower A, Technology Building II, 1057 Nanhai Avenue, Shenzhen, China
Factory: Shenzhen Eternity Technology Co., Ltd
Address of Factory: 1F, 2F, 4F Building A2, Yingzhan Industrial Zone, Longtian Community, Longtian Road, Pingshan District, Shenzhen, Guangdong Province, P.R. China
Product Name: LTE (CatM1,NB-IOT) Module
Model No.(EUT): M910-GL
Trade Mark: Fibocom
FCC ID: ZMOM910GL
Standards: 47 CFR Part 2
47 CFR Part 22 subpart H
47 CFR Part 24 subpart E
47 CFR Part 27 subpart C
47 CFR Part 90 subpart S
Date of Receipt: 2018-06-21
Date of Test: 2018-06-25 to 2018-08-05
Date of Issue: 2018-08-08

Test Result:	PASS*
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* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Derek Yang
Wireless Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2018-08-08		Original

Authorized for issue by:				
				2018-08-08
		<hr/> Mike Hu /Project Engineer		
				2018-08-08
		<hr/> David Chen /Reviewer		



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2 General Information

2.1 Client Information

Applicant:	Fibocom Wireless Inc.
Address of Applicant:	5/F, Tower A, Technology Building II, 1057 Nanhai Avenue, Shenzhen, China
Manufacturer:	Fibocom Wireless Inc.
Address of Manufacturer:	5/F, Tower A, Technology Building II, 1057 Nanhai Avenue, Shenzhen, China
Factory:	Shenzhen Eternity Technology Co., Ltd
Address of Factory:	1F, 2F, 4F Building A2, Yingzhan Industrial Zone, Longtian Community, Longtian Road, Pingshan District, Shenzhen, Guangdong Province, P.R. China

2.2 General Description of EUT

Product Name:	LTE (CatM1,NB-IOT) Module
Model No.:	M910-GL
Trade Mark:	Fibocom
Sample Type:	LTE (CatM1,NB-IOT) Module
Antenna Type:	PIFA

2.3 Test Mode

Test Mode	Test Modes Description	
GSM/TM1	GSM system, GPRS, GMSK modulation	
GSM/TM2	GSM system, EGPRS, 8PSK modulation	
	LTE-M1	LTE-NB1
LTE/TM1	LTE system, QPSK modulation	LTE system, BPSK modulation
LTE/TM2	LTE system, 16QAM modulation	LTE system, QPSK modulation

NOTE: The test mode(s) are selected according to relevant radio technology specifications.



2.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

2.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

2.6 Deviation from Standards

None.

2.7 Abnormalities from Standard Conditions

None.

2.8 Other Information Requested by the Customer

None.

3 RF Exposure Evaluation

3.1 RF Exposure Compliance Requirement

3.1.1 Limits

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30
F=frequency in MHz *=Plane-wave equivalent power density RF exposure compliance will need to be determined with respect to 1.1307(c) and (d) of the FCC rules. The emissions should be within the limits at 300kHz in Table 1 of 1.1310(use the 300kHz limits for 150kHz:614V/m,1.63A/m).				

Friis Formula

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

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

3.1.2 Test Procedure

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



3.1.3 EUT RF Exposure Evaluation

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.0 / 2.0 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Operating Band	Frequency (MHz)	Max Conducted Average Output Power (dBm)	EIRP(ERP) Limit (dBm)	Gain according to EIRP (dBi)
GSM850	824.2	32.5	38.45	8.1
GSM1900	1850.2	30	33	3
LTE-M1 BAND 2	1850.1	24	33	9
LTE-M1 BAND 4	1710.1	24	30	6
LTE-M1 BAND 12	699.1	24	34.77	12.92
LTE-M1 BAND 13	777.1	24	34.77	12.92
LTE-M1 BAND 26(814-824)	814.1	24	50	28.15
LTE-M1 BAND 26(824-849)	824.1	24	38.45	16.6
LTE-NB1 BAND 2	1850.7	23.5	33	9.5
LTE-NB1 BAND 4	1710.7	23.5	30	6.5
LTE-NB1 BAND 12	699.7	23.5	34.77	13.42
LTE-NB1 BAND 13	779.5	23.5	34.77	13.42
LTE-NB1 BAND 26(814-824)	814.7	23.5	50	28.65
LTE-NB1 BAND 26(824-849)	824.7	23.5	38.45	17.1

Operating Band	Frequency (MHz)	Antenna Gain (dBi)	Max Conducted Average Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	Max Gain	Result
GSM850	824.2	-1.4	32.5	785.2356	0.1132	0.5495	5.46	PASS
GSM1900	1850.2	1.1	30	1288.2496	0.3302	1.0000	5.91	PASS
LTE-M1 BAND 2	1850.1	1.1	24	323.5937	0.0829	1.0000	11.91	PASS
LTE-M1 BAND 4	1710.1	1.6	24	363.0781	0.1044	1.0000	11.41	PASS
LTE-M1 BAND 12	699.1	-0.6	24	133.3521	0.0231	0.4661	12.44	PASS
LTE-M1 BAND 13	777.1	-0.8	24	127.3503	0.0211	0.5181	13.1	PASS
LTE-M1 BAND 26 (814-824)	814.1	-1.4	24	110.9175	0.0160	0.5427	13.9	PASS
LTE-M1 BAND 26 (824-849)	824.1	-1.4	24	110.9175	0.0160	0.5494	13.96	PASS
LTE-NB1 BAND 2	1850.7	1.1	23.5	288.4032	0.0739	1.0000	12.41	PASS
LTE-NB1 BAND 4	1710.7	1.6	23.5	323.5937	0.0931	1.0000	11.91	PASS

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LTE-NB1 BAND 12	699.7	-0.6	23.5	118.8502	0.0206	0.4665	12.95	PASS
LTE-NB1 BAND 13	779.5	-0.8	23.5	113.5011	0.0188	0.5197	13.61	PASS
LTE-NB1 BAND 26 (814-824)	814.7	-1.4	23.5	98.8553	0.0142	0.5431	14.41	PASS
LTE-NB1 BAND 26 (824-849)	824.7	-1.4	23.5	98.8553	0.0142	0.5498	14.46	PASS

The Max allowed antenna gain is as following table showed:

Operating Band	Antenna Gain (dBi)
GSM850	5.46
GSM1900	3
LTE-M1 BAND 2	9
LTE-M1 BAND 4	6
LTE-M1 BAND 12	12.44
LTE-M1 BAND 13	12.92
LTE-M1 BAND 26(814-824)	13.9
LTE-M1 BAND 26(824-849)	13.96
LTE-NB1 BAND 2	9.5
LTE-NB1 BAND 4	6.5
LTE-NB1 BAND 12	12.95
LTE-NB1 BAND 13	13.42
LTE-NB1 BAND 26(814-824)	14.41
LTE-NB1 BAND 26(824-849)	14.46

Note: Refer to report No. SZEM180400321702 for EUT test Max Conducted Peak Output Power value.

The distancer (6th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.