



RF Exposure Evaluation Report

Application No.: ZR/2019/50017
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: DongGuan Huabel Electronic Technology Co., Ltd
Address of Factory: No.9, Industrial Northern Road, National High Tech Industrial Development Zone, SongShan Lake DongGuan city, Guangdong province P.R.China
EUT Description: LTE Module
Model No.: NL668-LA
Trade Mark: Fibocom
FCC ID: ZMONL668LA
Standards: 47 CFR Part 2
47 CFR Part 22 subpart H
47 CFR Part 24 subpart E
47 CFR Part 27 subpart C
Date of Receipt: 2019/5/13
Date of Test: 2019/5/14 to 2019/6/2
Date of Issue: 2019/6/3

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



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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2019/6/3		Original

Authorized for issue by:				
				2019/6/3
		Mike Hu /Project Engineer		
				2019/6/3
		David Chen /Reviewer		





Contents

1	VERSION.....	2
2	GENERAL INFORMATION.....	4
2.1	CLIENT INFORMATION	4
2.2	TEST LOCATION	4
2.3	TEST FACILITY	4
2.4	GENERAL DESCRIPTION OF EUT.....	5
3	RF EXPOSURE EVALUATION	6
3.1	RF EXPOSURE COMPLIANCE REQUIREMENT	6
3.1.1	Limits.....	6
3.1.2	Test Procedure.....	6
3.1.3	EUT RF Exposure Evaluation	7



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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:	DongGuan Huabel Electronic Technology Co., Ltd
Address of Factory:	No.9, Industrial Northern Road, National High Tech Industrial Development Zone, SongShan Lake DongGuan city, Guangdong province P.R.China

2.2 Test Location

Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
Post code:	518057
Telephone:	+86 (0) 755 2601 2053
Fax:	+86 (0) 755 2671 0594
E-mail:	ee.shenzhen@sgs.com

2.3 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.



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2.4 General Description of EUT

EUT Description::	LTE Module
Model No.:	NL668-LA
Trade Mark:	Fibocom
Hardware Version:	V1.0.0
Software Version:	19006.1000.15.02.00.04
Antenna Gain:	GSM850:-1.4dBi; GSM1900:1dBi WCDMA Band II:1dBi WCDMA Band VI:1dBi WCDMA Band V:-1.4dBi LTE Band 2:1dBi; LTE Band 4:1dBi; LTE Band 5:-1.4dBi; LTE Band 7: 2.5dBi LTE Band 12:-1.4dBi; LTE Band 17:-1.4dBi; LTE Band 38:1.5dBi; LTE Band 66:1dBi;



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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)	Antenna Gain (dBi)	Max Conducted Average Output Power (dBm)	Output Power to Antenna (dBm)	EIRP(ERP) Limit (dBm)	Output Power to Antenna (mw)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	Gain according to EIRP (dBi)	Gain according to Pd (dBi)	Max Gain Allowed (dBi)	conclusion
GSM850	824.2	-1.40	33.50	29.95	38.45	2238.7211	0.3226	0.5495	7.10	0.91	0.91	Pass
GSM1900	1850.2	1.00	30.50	31.50	33.00	1122.0185	0.2810	1.0000	2.50	6.51	2.50	Pass
WCDMA B2	1852.4	1.00	24.50	25.50	33.00	281.8383	0.0706	1.0000	8.50	12.51	8.50	Pass
WCDMA B4	1712.4	1.00	24.50	25.50	30.00	281.8383	0.0706	1.0000	5.50	12.51	5.50	Pass
WCDMA B5	826.4	-1.40	24.50	20.95	38.45	281.8383	0.0406	0.5509	16.10	9.92	9.92	Pass
LTE B2	1850.7	1.00	24.00	25.00	33.00	251.1886	0.0629	1.0000	9.00	13.01	9.00	Pass
LTE B4	1710.7	1.00	24.00	25.00	30.00	251.1886	0.0629	1.0000	6.00	13.01	6.00	Pass
LTE B5	824.70	-1.40	24.00	20.45	38.45	251.1886	0.0362	0.5498	16.60	10.41	10.41	Pass
LTE B7	2502.50	2.50	24.00	26.50	33.00	251.1886	0.0889	1.0000	9.00	13.01	9.00	Pass
LTE B12	699.70	-1.40	24.00	20.45	34.77	251.1886	0.0362	0.4665	12.92	9.70	9.70	Pass
LTE B17	706.5	-1.40	24.00	20.45	34.77	251.1886	0.0362	0.4710	12.92	9.74	9.74	Pass
LTE B38	2572.5	1.50	24.00	25.50	33.00	251.1886	0.0706	1.0000	9.00	13.01	9.00	Pass
LTE B66	1710.7	1.00	24.00	25.00	30.00	251.1886	0.0629	1.0000	6.00	13.01	6.00	Pass

Remark: Refer to report No. ZR/2019/5001701 for EUT test Max Conducted Output Power value.



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