



# RF EXPOSURE EVALUATION REPORT

**APPLICANT** : Fibocom Wireless Inc.  
**PRODUCT NAME** : LTE Module  
**MODEL NAME** : FG101-NA  
**BRAND NAME** : Fibocom  
**FCC ID** : ZMOFG101NA  
**STANDARD(S)** : FCC 47 CFR Part 2(2.1091)  
**RECEIPT DATE** : 2023-06-19  
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Change History		
Version	Date	Reason for Change
1.0	2023-07-20	First edition



# 1. Technical Information

**Note:** Provide by applicant.

## 1.1 Applicant and Manufacturer Information

<b>Applicant:</b>	Fibocom Wireless Inc.
<b>Applicant Address:</b>	1101,Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China
<b>Manufacturer:</b>	Fibocom Wireless Inc.
<b>Manufacturer Address:</b>	1101,Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China

## 1.2 Equipment under Test (EUT) Description

<b>Product Name:</b>	LTE Module
<b>EUT No.:</b>	2#
<b>Hardware Version:</b>	V1.2
<b>Software Version:</b>	19101.1000.01.00.00.07
<b>Frequency Bands:</b>	WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 29(RX): 717 MHz ~728 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 46(RX): 5150 MHz ~ 5925 MHz LTE Band 48: 3550 MHz ~3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz
<b>Modulation Mode:</b>	WCDMA: QPSK,16QAM



	LTE: QPSK, 16QAM, 64QAM	
<b>Carrier Aggregation:</b>	Uplink & Downlink	
<b>Antenna Type:</b>	WWAN: Fixed External Antenna	
<b>Antenna Gain:</b>	Frequency Bands	Antenna Gain (dBi)
	WCDMA Band II	4.07
	WCDMA Band IV	4.07
	WCDMA Band V	2.2
	LTE Band 2	4.07
	LTE Band 4	4.07
	LTE Band 5	2.2
	LTE Band 7	4.07
	LTE Band 12	2.2
	LTE Band 13	2.2
	LTE Band 14	2.2
	LTE Band 17	2.2
	LTE Band 25	4.07
	LTE Band 26	2.2
	LTE Band 30	0.22
	LTE Band 41	4.07
	LTE Band 48	-1.18
LTE Band 66	4.07	
LTE Band 71	2.2	

**Note:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.



### 1.3 Applied Reference Documents

Leading reference documents for testing:

Identity	Document Title	Method determination /Remark
FCC 47 CFR Part 2(2.1091)	Radio Frequency Radiation Exposure Assessment: mobile devices	No deviation
KDB 447498 D01v06	General RF Exposure Guidance	No deviation
<b>Note 1:</b> Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.		



## 2. Device Category and RF Exposure Limit

Per user manual, Based on 47CFR 2.1091, this device belongs to mobile device category with General Population/Uncontrolled exposure.

### Mobile Devices:

47CFR 2.1091(b)

For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

### General Population/Uncontrolled Exposure:

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

**Table 1—Limits for Maximum Permissible Exposure (MPE)**

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	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



### 3. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial No./ SW Version	Calibration	
				Last Cal.	Due Date
Anritsu	Network Emulator	MT8820C	6201091290	2023.02.09	2024.02.08
Anritsu	Network Emulator	MT8821C	6261830572	2023.02.09	2024.02.08

**Note:**

The EUT was connected to Base Station Anritsu MT8820C referred to the Setup Configuration. For the maximum power, it was established between EUT and Base Station with following setting:

1. For WCDMA testing, Power Ctrl Mode = All Up bits, and the transmitted maximum output power was recorded.
2. For LTE testing, the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and different configurations.

### 4. RF Output Power

Remark: The output power of WWAN refers to the annex B of this report.

## 5. LTE Carrier Aggregation

### ➤ Carrier Aggregation Configuration

#### <Intra-band>

2CC Uplink Carrier Aggregation for Intra-band				
No.	Combination	MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_5B	-	-	No
2	CA_7C	-	-	No
3	CA_41C	-	-	No

#### Note:

1. According to the 3GPP 36.101 table 6.2.2A-1 specifics that the aggregation maximum allowed output power is equivalent to the signal carrier scenario for intra-band contiguous carrier aggregation scenarios. When the non-contiguous RB allocation is applied the MPR shell complies with the table 6.2.3A defined in 3GPP 36.101.
2. According to the TCB Workshop publication, the output power of uplink CA would be measured with the wideband signal integration over the component carriers. And SAR measurement would be performed at the worst exposure condition of each band.
3. Additional SAR measurement for LTE UL CA with other DL CA combinations are not required when the maximum output power of this configuration is not  $> 1/4$  dB higher than the maximum output power for UL CA active.
4. The output power of CA uplink refers to the annex B of this report.

### ➤ Carrier Aggregation Configuration

2CC Downlink Carrier Aggregation				
No.	Combination	4X4 MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_2A-4A	2A,4A	-	No
2	CA_2A-5A	2A	-	No
3	CA_2A-12A	2A	-	No
4	CA_2A-13A	2A	-	No
5	CA_2A-14A	2A	-	No
6	CA_2A-29A	2A	-	No
7	CA_2A-30A	30A,2A	-	No
8	CA_2A-66A	2A,66A	-	No
9	CA_4A-5A	4A	-	No
10	CA_4A-12A	4A	-	No
11	CA_4A-13A	4A	-	No
12	CA_4A-29A	4A	-	No





13	CA_4A-30A	4A,30A	-	No
14	CA_5A-30A	30A	-	No
15	CA_5A-66A	66A	-	No
16	CA_12A-30A	30A	-	No
17	CA_13A-66A	66A	-	No
18	CA_14A-30A	30A	-	No
19	CA_14A-66A	66A	-	No
20	CA_29A-30A	30A	-	No
21	CA_2A-2A	-	-	No
22	CA_4A-4A	4A	-	No
23	CA_25A-25A	-	-	No
24	CA_25A-26A	25A	-	No
25	CA_25A-41A	25A,41A	-	No
26	CA_26A-41A	41A	-	No
27	CA_41A-41A	-	-	No
28	CA_66A-66A	66A	-	No
29	CA_2C	-	-	No
30	CA_5B	-	-	No
31	CA_41C	-	-	No
32	CA_66C	-	-	No
33	CA_2A-46A	2A	-	No
34	CA_4A-46A	4A	-	No
35	CA_13A-46A	-	-	No
36	CA_25A-46A	25A	-	No
37	CA_46A-66A	66A	-	No
38	CA_5A-46A	-	-	No
39	CA_12A-66A	66A	-	No
40	CA_29A-66A	66A	-	No
41	CA_30A-66A	30A,66A	-	No
42	CA_66B	-	-	No
43	CA_4A-71A	4A	-	No
44	CA_2A-71A	2A	-	No
45	CA_66A-71A	66A	-	No
46	CA_48C	-	-	No
47	CA_2A-48A	2A	-	No
48	CA_5A-48A	-	-	No
49	CA_13A-48A	-	-	No
50	CA_48A-66A	66A	-	No



51	CA_2A-7A	2A,7A	-	No
52	CA_4A-7A	4A,7A	-	No
53	CA_7A-7A	-	-	No
54	CA_7A-12A	7A	-	No
55	CA_7A-66A	66A,7A	-	No
56	CA_5A-5A	-	-	No
57	CA_12A-12A	-	-	No
58	CA_12A-25A	25A	-	No
59	CA_12A-46A	-	-	No
60	CA_12B	-	-	No
61	CA_26A-46A	-	-	No
62	CA_5A-25A	25A	-	No
63	CA_5A-41A	41A	-	No
64	CA_5A-7A	7A	-	No
65	CA_7A-46A	7A	-	No
66	CA_7B	-	-	No
67	CA_7C	-	-	No

3CC Downlink Carrier Aggregation				
No.	Combination	4X4 MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_2A-4A-4A	-	-	No
2	CA_2A-4A-5A	-	-	No
3	CA_2A-4A-12A	-	-	No
4	CA_2A-4A-13A	-	-	No
5	CA_2A-5A-30A	-	-	No
6	CA_2A-12A-30A	-	-	No
7	CA_2A-29A-30A	-	-	No
8	CA_2A-5A-66A	-	-	No
9	CA_2A-13A-66A	-	-	No
10	CA_2A-14A-30A	-	-	No
11	CA_2A-14A-66A	-	-	No
12	CA_2A-30A-66A	-	-	No
13	CA_2A-66A-66A	-	-	No
14	CA_4A-5A-30A	-	-	No
15	CA_4A-12A-30A	-	-	No
16	CA_4A-29A-30A	-	-	No
17	CA_2A-2A-5A	-	-	No



18	CA_2A-2A-12A	-	-	No
19	CA_2A-2A-13A	-	-	No
20	CA_2A-2A-30A	-	-	No
21	CA_2A-2A-66A	-	-	No
22	CA_4A-4A-5A	-	-	No
23	CA_4A-4A-12A	-	-	No
24	CA_4A-4A-13A	-	-	No
25	CA_13A-66A-66A	-	-	No
26	CA_14A-30A-66A	-	-	No
27	CA_2A-5B	-	-	No
28	CA_2A-66C	-	-	No
29	CA_5A-66A-66A	-	-	No
30	CA_5B-30A	-	-	No
31	CA_5B-66A	-	-	No
32	CA_25A-41C	-	-	No
33	CA_26A-41C	-	-	No
34	CA_41A-41C	-	-	No
35	CA_66A-66C	-	-	No
36	CA_41D	-	-	No
37	CA_2A-5A-46A	-	-	No
38	CA_2A-13A-46A	-	-	No
39	CA_2A-46A-66A	-	-	No
40	CA_2A-46C	-	-	No
41	CA_4A-46C	-	-	No
42	CA_5A-46A-66A	-	-	No
43	CA_13A-46A-66A	-	-	No
44	CA_13A-46C	-	-	No
45	CA_5A-46C	-	-	No
46	CA_2A-12A-66A	-	-	No
47	CA_2A-66B	-	-	No
48	CA_5A-30A-66A	-	-	No
49	CA_5A-66B	-	-	No
50	CA_12A-30A-66A	-	-	No
51	CA_12A-66A-66A	-	-	No
52	CA_13A-66B	-	-	No
53	CA_29A-30A-66A	-	-	No
54	CA_29A-66A-66A	-	-	No
55	CA_30A-66A-66A	-	-	No



56	CA_46C-66A	-	-	No
57	CA_2A-2A-46A	-	-	No
58	CA_2A-4A-71A	-	-	No
59	CA_4A-4A-71A	-	-	No
60	CA_2A-2A-71A	-	-	No
61	CA_13A-48C	-	-	No
62	CA_5A-48C	-	-	No
63	CA_48D	-	-	No
64	CA_2A-48A-66A	-	-	No
65	CA_2A-48C	-	-	No
66	CA_2A-5A-48A	-	-	No
67	CA_2A-13A-48A	-	-	No
68	CA_5A-48A-66A	-	-	No
69	CA_13A-48A-66A	-	-	No
70	CA_12A-66C	-	-	No
71	CA_66A-66A-71A	-	-	No
72	CA_2A-66A-71A	-	-	No
73	CA_2A-2A-4A	-	-	No
74	CA_4A-5B	-	-	No
75	CA_5A-5A-66A	-	-	No
76	CA_5A-66C	-	-	No
77	CA_13A-66C	-	-	No
78	CA_4A-48C	-	-	No
79	CA_2A-2A-14A	-	-	No
80	CA_14A-66A-66A	-	-	No
81	CA_2C-66A	-	-	No
82	CA_66C-71A	-	-	No
83	CA_2A-4A-30A	-	-	No
84	CA_12A-46C	-	-	No
85	CA_12A-66B	-	-	No
86	CA_25A-25A-26A	-	-	No
87	CA_25A-25A-41A	-	-	No
88	CA_25A-26A-41A	-	-	No
89	CA_25A-41A-41A	-	-	No
90	CA_25A-46C	-	-	No
91	CA_26A-41A-41A	-	-	No
92	CA_2A-12A-12A	-	-	No
93	CA_2A-12A-46A	-	-	No



94	CA_2A-12B	-	-	No
95	CA_2A-29A-66A	-	-	No
96	CA_2A-2A-29A	-	-	No
97	CA_2A-4A-29A	-	-	No
98	CA_2A-4A-7A	-	-	No
99	CA_2A-7A-12A	-	-	No
100	CA_2A-7A-66A	-	-	No
101	CA_2A-7A-7A	-	-	No
102	CA_2A-7C	-	-	No
103	CA_2C-12A	-	-	No
104	CA_2C-29A	-	-	No
105	CA_2C-30A	-	-	No
106	CA_2C-5A	-	-	No
107	CA_4A-12A-12A	-	-	No
108	CA_4A-12B	-	-	No
109	CA_4A-4A-29A	-	-	No
110	CA_4A-4A-30A	-	-	No
111	CA_4A-4A-7A	-	-	No
112	CA_4A-7A-12A	-	-	No
113	CA_4A-7A-7A	-	-	No
114	CA_4A-7C	-	-	No
115	CA_5A-7A-46A	-	-	No
116	CA_5A-7A-7A	-	-	No
117	CA_5A-7C	-	-	No
118	CA_66A-66B	-	-	No
119	CA_66D	-	-	No
120	CA_7A-46C	-	-	No
121	CA_7A-66A-66A	-	-	No

**Note:**

1. Uplink maximum output power with downlink carrier aggregation active does not show more than  $\frac{1}{4}$  dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.
2. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.
3. Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than  $\frac{1}{4}$  dB higher than the maximum output power

measured when downlink carrier aggregation inactive.

4. For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band.
5. For Intra-band, contiguous CA, the downlink channels selected to perform the uplink power measurement must satisfy 7. 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements.

$$\text{Nominal channel spacing} = \left\lceil \frac{BW_{\text{Channel}(1)} + BW_{\text{Channel}(2)} - 0.1|BW_{\text{Channel}(1)} - BW_{\text{Channel}(2)}|}{0.6} \right\rceil 0.3 \text{ [MHz]}$$

## 6. RF Exposure Assessment

### ➤ Standalone Transmission Assessment

#### <Standalone Antenna Transmission Assessment>

Bands	Frequency (MHz)	Tune-up Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	PD (mW/cm <sup>2</sup> )	Limit Value (mW/cm <sup>2</sup> )
WCDMA Band 2	1880	24.5	4.07	719.45	0.143	1.0
WCDMA Band 4	1732.6	24.5	4.07	719.45	0.143	1.0
WCDMA Band 5	836.4	24.5	2.2	467.74	0.093	0.558
LTE Band 2	1860	24.0	4.07	641.21	0.128	1.0
LTE Band 4	1720	24.0	4.07	641.21	0.128	1.0
LTE Band 5	844	24.0	2.2	416.87	0.083	0.563
LTE Band 7	2535	24.0	4.07	641.21	0.128	1.0
LTE Band 12	711	24.0	2.2	416.87	0.083	0.474
LTE Band 13	782	24.0	2.2	416.87	0.083	0.521
LTE Band 14	793	24.0	2.2	416.87	0.083	0.529
LTE Band 17	710	24.0	2.2	416.87	0.083	0.473
LTE Band 25	1882.5	24.0	4.07	641.21	0.128	1.0
LTE Band 26	831.5	24.0	2.2	416.87	0.083	0.554
LTE Band 30	2310	24.0	0.22	264.24	0.053	1.0
LTE Band 41	2593	24.0	4.07	641.21	0.128	1.0
LTE Band 41 (HPUE)	2593	27.0	4.07	1279.38	0.255	1.0
LTE Band 48	3625	24.0	-1.18	191.43	0.038	1.0
LTE Band 66	1745	24.0	4.07	641.21	0.128	1.0
LTE Band 71	683	24.0	2.2	416.87	0.083	0.455

#### <CA Transmission Assessment>

Bands	Frequency (MHz)	Tune-up Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	PD (mW/cm <sup>2</sup> )	Limit Value (mW/cm <sup>2</sup> )
CA_5B	831.6	23.5	2.2	371.54	0.074	0.554
CA_7C	2535	23.5	4.07	571.48	0.114	1.0
CA_41C	2583.1	25.5	4.07	905.73	0.180	1.0

#### Note:

1. According to KDB 447498, MPE assessment is based on source-based time-averaged maximum conducted output power of the RF channel requiring assessment, adjusted for



tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

2. MPE calculate method

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

Where: S= Power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = Time-average maximum tune-up power (in appropriate units, e.g. dBm)

G = numeric gain of the antenna (in appropriate units, e.g. dBi)

R = Separation distance to the centre of radiation of the antenna (20cm)

➤ **Simultaneous Transmission Assessment**

This device only incorporates one WWAN transmitter, therefore simultaneous assessment is not required.

➤ **Conclusion**

According to FCC 47 CFR Part 2(2.1091), this device complies with human exposure basic restrictions.





## Annex A General Information

### 1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
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### 2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

### 3. Facilities and Accreditations

The FCC designation number is CN1192, the test firm registration number is 226174.

#### Note:

The main report is end here and the other Annex B will be submitted separately.

————— END OF REPORT —————