



TEST REPORT

REPORT NUMBER: B19W50622-MPE-Rev2

ON

Type of Equipment:

LTE Module

Type of Designation:

L710

Manufacturer:

Shanghai MobileTek Communication Ltd

FCC ID:

2AK9D-L710

ACCORDING TO

FCC CFR 47 Part 2.1091 《Radiofrequency radiation exposure evaluation: mobile devices》

FCC CFR 47 Part1.1310 《Radiofrequency radiation exposure limits》

Chongqing Academy of Information and Communication Technology

Month date, year

Jul, 3, 2020

Signature

Zhang Yan

Director

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of Chongqing Academy of Information and Communications Technology.



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Revision Version

Report Number	Revision	Date	Memo
B19W50621-MPE	00	2020-06-09	Initial creation of test report
B19W50621-MPE-Rve1	01	2020-07-03	--
B19W50621-MPE-Rve2	02	2020-07-07	--

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1. Test Laboratory

1.1. Testing Location

Company Name:	Chongqing Academy of Information and Communications Technology
Address:	No. 8, Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China
Postal Code:	401336
Telephone:	0086-23-88069965
Fax:	0086-23-88608777
Website:	http://www.cqcatr.com

1.2. Testing Environment

Normal Temperature:	21.3℃
Relative Humidity:	75%

1.3. Project Data

Testing Start Date:	2019-11-26
Testing End Date:	2019-11-26

1.4. Signature



2020-07-07

Fu Bohao
(Prepared this test report)

Date



2020-07-07

Wang Lili
(Reviewed this test report)

Date



2020-07-07

Zhang Yan
Director of the laboratory
(Approved this test report)

Date

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2. Client Information

2.1. Applicant Information

Company Name:	Shanghai MobileTek Communication Ltd
Address /Post:	Free Trade Zone No.33, No.17 building 6H Xiya Road,shanghai
Telephone:	18616835910
Fax:	+86-21-54451877
Email:	b.yang@mobiletek.cn
Contact Person:	bin yang

2.2. Manufacturer Information

Company Name:	Shanghai MobileTek Communication Ltd
Address /Post:	Free Trade Zone No.33, No.17 building 6H Xiya Road,shanghai
Telephone:	18616835910
Fax:	+86-21-54451877
Email:	b.yang@mobiletek.cn
Contact Person:	bin yang

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description:	LTE Module
Model name:	L710
GSM Frequency Band	GPRS 850/1900
EGSM Frequency Band	EGPRS 850/1900
NB2 Frequency Band	Band2/4/5/12/13/26
CatM1 Frequency Band	Band2/4/5/12/13/26
Note: Photographs of EUT are shown in ANNEX A of this test report.	

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
S5	353081090297923	V2	L710v03.01b01.00	2019-11-20

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

EUT ID*	SN	Description
NA	NA	NA

*AE ID: is used to identify the test sample in the lab internally.

4. Reference Documents

4.1. Applicable Standards

The MPE report was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 2.1091.

FCC CFR 47 Part 2.1091: Radiofrequency radiation exposure evaluation: mobile devices

4.2. Test Limits

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

MPE for the upper tier (people in controlled environments)

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 Exposure				
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
1500-100000	--	--	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
1500-100000	--	--	1.0	30

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

For the DUT, the limits for the general public when an RF safety program is unavailable.

5. Test Results

5.1. RF Power Output

Frequency Band	Highest Averaged Power Output(dBm)	Highest Frame-Averaged Output Power (dBm)	Antenna Gain(dBi)
GPRS 850(1TS)	31.0	21.97	4
GPRS 850(2TS)	31.0	24.98	4
GPRS 850(3TS-low Channel)	31.0	26.74	4
EGPRS 850(1TS)	31.0	21.97	4
EGPRS 850(2TS)	31.0	24.98	4
EGPRS 850(3TS-low Channel)	31.0	26.74	4
GPRS 1900(4TS)	31.0	27.99	3
EGPRS 1900(4TS)	31.0	27.99	3
NB2 Band2	23.545	23.545	3
NB2 Band4	23.955	23.955	4
NB2 Band5	22.91	22.91	4
NB2 Band12	23.31	23.31	4
NB2 Band13	23.635	23.635	4
NB2 Band26	22.925	22.925	4
CATM1 Band2	25.0	25.0	3
CATM1 Band4	25.0	25.0	4
CATM1 Band5	24.575	24.575	4
CATM1 Band12	24.59	24.59	4
CATM1 Band13	25.415	25.415	4
CATM1 Band26	24.575	24.575	4

Notes:

1) Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

2) According to the conducted power as above, the measurements are performed with 1Txslots for 850MHz and 1900MHz.

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5.2. Calculation Information

For conservative evaluation consideration, only maximum power of each frequency band based on the tighter limits respectively are used to calculate the boundary power density.

Based on the FCC KDB 447498 D01 and 47 CFR §2.1091, the DUT is evaluated as a mobile device.

$$S = \frac{PG}{4\pi d^2}$$

Where

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

5.3. Results

Frequency range	Limit(mW/cm ²)	Results(mW/cm ²)	Verdict
GPRS 850(1TS)	0.549	0.079	pass
GPRS 850(2TS)	0.549	0.157	Pass
GPRS 850(3TS-low Channel)	0.549	0.236	pass
EGPRS 850(1TS)	0.549	0.079	Pass
EGPRS 850(2TS)	0.549	0.157	Pass
EGPRS 850(3TS-low Channel)	0.549	0.236	Pass
GPRS 1900 4TS	1.000	0.250	Pass
EGPRS 1900 4TS	1.000	0.250	pass
NB2 Band2	1.000	0.090	Pass
NB2 Band4	1.000	0.124	Pass
NB2 Band5	0.549	0.098	Pass
NB2 Band12	0.466	0.107	Pass
NB2 Band13	0.518	0.115	Pass

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NB2 Band26	0.543	0.098	Pass
CATM1 Band2	1.000	0.126	Pass
CATM1 Band4	1.000	0.158	Pass
CATM1 Band5	0.549	0.143	Pass
CATM1 Band12	0.466	0.144	Pass
CATM1 Band13	0.518	0.174	Pass
CATM1 Band26	0.543	0.143	Pass

5.4. Result of GPRS 850 1TS

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.2~848.8MHz; The maximum conducted is 21.97 dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: $824.2/1500=0.549 \text{ mW/cm}^2$.

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (157.398 mW)

G = antenna gain (1.995numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(157.398*1.995)/(4\pi*20^2)=0.079\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.549 mW/cm^2 limit for uncontrolled exposure.

5.5. Result of GPRS 850 2TS

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.2~848.8MHz; The maximum conducted is 24.98 dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: $824.2/1500=0.549 \text{ mW/cm}^2$.

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (314.775 mW)

G = antenna gain (1.995numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(314.775 *1.995)/(4\pi*20^2)=0.157\text{mW/cm}^2$$

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Therefore, at 20 cm the spectral power density is less than the 0.549 mW/cm² limit for uncontrolled exposure.

5.6. Result of GPRS 850 3TS-low Channel

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.2~848.8MHz; The maximum conducted is 26.74 dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: $824.2/1500=0.549$ mW/cm².

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (472.063 mW)

G = antenna gain (1.995numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(472.063*1.995)/(4\pi*20^2)=0.236\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.549 mW/cm² limit for uncontrolled exposure.

5.7. Result of EGPRS 850 1TS

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.2~848.8MHz; The maximum conducted is 21.97 dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: $824.2/1500=0.549$ mW/cm².

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (157.398 mW)

G = antenna gain (1.995numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(157.398*1.995)/(4\pi*20^2)=0.079\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.549 mW/cm² limit for uncontrolled exposure.

5.8. Result of EGPRS 850 2TS

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.2~848.8MHz; The maximum conducted is 24.98 dBm. The maximum gain is 4.0 dBi. Therefore, maximum

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limit for general public RF exposure: $824.2/1500=0.549 \text{ mW/cm}^2$.

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (314.775 mW)

G = antenna gain (1.995numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(314.775 * 1.995)/(4 \pi * 20^2)=0.157 \text{ mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.549 mW/cm^2 limit for uncontrolled exposure.

5.9. Result of EGPRS 850 3TS-low Channel

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.2~848.8MHz; The maximum conducted is 26.74 dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: $824.2/1500=0.549 \text{ mW/cm}^2$.

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (472.063 mW)

G = antenna gain (1.995numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(472.063 * 1.995)/(4 \pi * 20^2)=0.236 \text{ mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.549 mW/cm^2 limit for uncontrolled exposure.

5.10. Result of GPRS 1900 4TS

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1850.2~1909.8 MHz; The maximum conducted is 27.99dBm. The maximum gain is 3.0 dBi. Therefore, maximum limit for general public RF exposure: 1.0 mW/cm^2 .

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (629.506 mW)

G = antenna gain (1.995numeric)

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r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(629.506*1.995)/(4\pi*20^2)=0.250\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 1.0mW/cm² limit for uncontrolled exposure.

5.11. Result of EGPRS 1900 4TS

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1850.2~1909.8 MHz; The maximum conducted is 27.99dBm. The maximum gain is 3.0 dBi. Therefore, maximum limit for general public RF exposure: 1.0 mW/cm².

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (629.506 mW)

G = antenna gain (1.995numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(629.506*1.995)/(4\pi*20^2)=0.250\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 1.0mW/cm² limit for uncontrolled exposure.

5.12. Result of NB2 Band 2

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1850.0~1909.9 MHz; The maximum conducted is 23.545dBm. The maximum gain is 3.0 dBi. Therefore, maximum limit for general public RF exposure:1.0 mW/cm².

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (226.204 mW)

G = antenna gain (1.995numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(226.204*1.995)/(4\pi*20^2)=0.090\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 1.0 mW/cm² limit for uncontrolled exposure.

5.13. Result of NB2 Band 4

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1710.0~ 1754.9MHz; The

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maximum conducted is 23.955dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: 1 mW/cm².

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (248.599mW)

G = antenna gain (2.512numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(248.599*2.512)/(4\pi*20^2)=0.124\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 1mW/cm² limit for uncontrolled exposure.

5.14. Result of NB2 Band 5

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.0~848.9 MHz; The maximum conducted is 22.91dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: 824.0/1500=0.549 mW/cm².

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (195.434mW)

G = antenna gain (2.512numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(195.434*2.512)/(4\pi*20^2)=0.098\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.549mW/cm² limit for uncontrolled exposure.

5.15. Result of NB2 Band 12

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 699.0~715.9 MHz; The maximum conducted is 23.31dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: 699.0/1500=0.466 mW/cm².

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (214.289mW)

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G = antenna gain (2.512numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(214.289*2.512)/(4\pi*20^2)=0.107\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.466mW/cm^2 limit for uncontrolled exposure.

5.16. Result of NB2 Band 13

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 777.0~848.9 MHz; The maximum conducted is 23.635dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: $777.0/1500=0.518\text{ mW/cm}^2$.

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (230.940mW)

G = antenna gain (2.512numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(230.940*2.512)/(4\pi*20^2)=0.115\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.518mW/cm^2 limit for uncontrolled exposure.

5.17. Result of NB2 Band 26

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 814.0~848.9 MHz; The maximum conducted is 22.925dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: $814.0/1500=0.543\text{ mW/cm}^2$.

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (196.110mW)

G = antenna gain (2.512numeric)

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r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(196.110*2.512)/(4\pi*20^2)=0.098\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.543mW/cm^2 limit for uncontrolled exposure.

5.18. Result of CATM1 Band 2

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1850.0~1909.9 MHz; The maximum conducted is 25.0dBm. The maximum gain is 3.0 dBi. Therefore, maximum limit for general public RF exposure: 1.0 mW/cm^2 .

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (316.228 mW)

G = antenna gain (1.995numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(316.228*1.995)/(4\pi*20^2)=0.126\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 1.0 mW/cm^2 limit for uncontrolled exposure.

5.19. Result of CATM1 Band 4

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1710.0~1754.9 MHz; The maximum conducted is 25.0dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: 1 mW/cm^2 .

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (316.228 mW)

G = antenna gain (2.512numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(316.228*2.512)/(4\pi*20^2)=0.158\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 1 mW/cm^2 limit for uncontrolled exposure.

5.20. Result of CATM1 Band 5

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.0~848.9 MHz; The

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maximum conducted is 24.575dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: $824.0/1500=0.549 \text{ mW/cm}^2$.

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (286.748 mW)

G = antenna gain (2.512numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(286.748*2.512)/(4\pi*20^2)=0.143\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.549mW/cm^2 limit for uncontrolled exposure.

5.21. Result of CATM1 Band 12

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 699.0~715.9 MHz; The maximum conducted is 24.59dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: $699.0/1500=0.466 \text{ mW/cm}^2$.

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (287.740 mW)

G = antenna gain (2.512numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(287.740*2.512)/(4\pi*20^2)=0.144\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.466mW/cm^2 limit for uncontrolled exposure.

5.22. Result of CATM1 Band 13

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 777.0~786.9 MHz; The

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maximum conducted is 25.415dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: $777.0/1500=0.518 \text{ mW/cm}^2$.

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (347.937 mW)

G = antenna gain (2.512numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(347.937*2.512)/(4\pi*20^2)=0.174\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.518mW/cm^2 limit for uncontrolled exposure.

5.23. Result of CATM1 Band 26

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 814.0~848.9 MHz; The maximum conducted is 24.575dBm. The maximum gain is 4.0 dBi. Therefore, maximum limit for general public RF exposure: $814.0/1500=0.543 \text{ mW/cm}^2$.

$$S = \frac{PG}{4\pi d^2}$$

P= input power of the antenna (286.748mW)

G = antenna gain (2.512numeric)

r = distance to the center of radiation of antenna (in meter)=20 cm

$$S=(286.748*2.512)/(4\pi*20^2)=0.143\text{mW/cm}^2$$

Therefore, at 20 cm the spectral power density is less than the 0.543mW/cm^2 limit for uncontrolled exposure.



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ANNEX A: EUT photograph

See the document "L710 -External Photos".

*****END OF REPORT*****

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