TEST REPORT

REPORT NUMBER: I22W00056-MPE-Rev4

ON

Type of Equipment:	IoT Module
Type of Designation:	L710HG
Manufacturer:	Shanghai MobileTek Communication Ltd.
Brand Name:	LYNQ
FCC ID:	2AK9D-L710-HG

ACCORDING TO

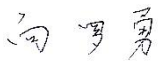
FCC CFR 47 Part 2.1091《Radiofrequency radiation exposure evaluation: mobile devices》
FCC CFR 47 Part1.1310《Radiofrequency radiation exposure limits》

Chongqing Academy of Information and Communication Technology

Month date, year

Sep,2,2022

Signature



Xiang Luoyong

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.

Revision Version

Report Number	Revision	Date	Memo
I22W00056-MPE	00	2022-8-12	Initial creation of test report
I22W00056-MPE-Rev1	01	2022-8-30	First change of test report
I22W00056-MPE-Rev2	02	2022-9-1	Second change of test report
I22W00056-MPE-Rev3	03	2022-9-1	Third change of test report
I22W00056-MPE-Rev4	04	2022-9-2	Forth change of test report
Note：This version has updated CAT-M1/NB-IoT B26, recalculated the power density value.			

CONTENTS

1. Test Laboratory

1.1. Testing Location

Company Name:	Chongqing Academy of Information andCommunications Technology
Address:	Building C, Technology Innovation Center, No.8, Yuma Road, Chayuan New Area, Nan'an District, Chongqing, People's Republic of China
Postal Code:	401336
Telephone:	0086-23-88069965
Fax:	0086-23-88608777

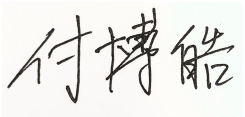
1.2. Testing Environment

Normal Temperature:	21.3℃
Relative Humidity:	65.0%

1.3. Project Data

Testing Start Date:	2022-8-12
Testing End Date:	2022-8-12

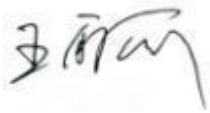
1.4. Signature



2022-9-2

Wang Chengyu
(Prepared this test report)

Date



2022-9-2

Wang Lili
(Reviewed this test report)

Date

2022-9-2

Xiang Luoyong
Director of the laboratory
(Approved this test report)

Date

2. Client Information

2.1. Applicant Information

Company Name:	Shanghai MobileTek Communication Ltd.
Address /Post:	Free Trade Zone No. 33, No. 17 building 6H3 Xiya Road China (Shanghai)
Country:	CHINA
Telephone:	15821966417
Fax:	--
Email:	qh.zhang@mobiletek.cn
Contact Person:	Qinghua Zhang

2.2. Manufacturer Information

Company Name:	Shanghai MobileTek Communication Ltd.
Address /Post:	Free Trade Zone No. 33, No. 17 building 6H3 Xiya Road China (Shanghai)
Country:	CHINA
Telephone:	15821966417
Fax:	--
Email:	qh.zhang@mobiletek.cn
Contact Person:	Qinghua Zhang

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

3.1. About EUT

EUT Description:	IoT Module
Model name:	L710HG
GSM Frequency Band:	GSM850/1900
LTE CAT-M1 Frequency Band:	B2/B4/B5/B12/B13/B26
LTE NB-IoT Frequency Band:	B2/B4/B5/B12/B13/B26
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
S4	866884046100699	V4	L710v09.01b01HGN_FGP.01	2022-7-11

*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 mannerthat ensures that the public is not exposed to radio frequency energy level in excesslimit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2Subpart J, section 2.1091 this device has been defined as a mobile device whereby adistance 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. Tune Up Power

Frequency Band	Highest Averaged Tune Up Power(dBm)	Highest Averaged Frame- Tune Up Power (dBm)	Antenna Gain(dBi)
GPRS850 4TX	33.87	30.86	3.5
GPRS1900 4TX	31.50	28.49	2
EGPRS850 4TX	27.00	23.99	3.5
EGPRS1900 4TX	27.50	24.49	2
CAT-M1 Band 2	25.00	25.00	2
CAT-M1 Band 4	25.00	25.00	4
CAT-M1 Band 5	25.00	25.00	3.5
CAT-M1 Band12	25.00	25.00	4
CAT-M1 Band 13	24.00	24.00	4
CAT-M1 Band 26 （814M~824M）	25.00	25.00	4
CAT-M1 Band 26 （824M~849M）	25.00	25.00	3.5
NB-IoT Band 2	23.00	23.00	2
NB-IoT Band 4	23.50	23.50	4
NB-IoT Band 5	23.00	23.00	3.5
NB-IoT Band 12	23.00	23.00	4
NB-IoT Band 13	23.00	23.00	4
NB-IoT Band 26 （814M~824M）	12.00	12.00	4
NB-IoT Band 26 （824M~849M）	23.00	23.00	3.5

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) Disclaimers： The antenna gain in the above table are provided by the customer

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
GPRS850 4TX	0.55	0.54	PASS
GPRS1900 4TX	1.00	0.22	PASS
EGPRS850 4TX	0.55	0.11	PASS
EGPRS1900 4TX	1.00	0.09	PASS
CAT-M1 Band 2	1.00	0.10	PASS
CAT-M1 Band 4	1.00	0.16	PASS
CAT-M1 Band 5	0.55	0.14	PASS
CAT-M1 Band12	0.47	0.16	PASS
CAT-M1 Band 13	0.52	0.13	PASS
CAT-M1 Band 26 （814MHz~824MHz）	0.54	0.16	PASS
CAT-M1 Band 26 （824MHz~849MHz）	0.55	0.14	PASS
NB-IoT Band 2	1.00	0.06	PASS
NB-IoT Band 4	1.00	0.07	PASS
NB-IoT Band 5	0.55	0.09	PASS
NB-IoT Band 12	0.47	0.10	PASS
NB-IoT Band 13	0.52	0.10	PASS
NB-IoT Band 26 （814MHz~824MHz）	0.54	0.01	PASS
NB-IoT Band 26 （824MHz~849MHz）	0.55	0.09	PASS

5.4. Result of GPRS 850 4TX

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.20 MHz～848.80 MHz; The maximum conducted is 30.86 dBm. The maximum gain is 3.50 dBi. Therefore, maximum limit for general public RF exposure: 824.20/1500=0.55 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.54 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.55 mW/cm^2 limit for uncontrolled exposure.

5.5. Result of GPRS 1900 4TX

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1850.20 MHz～1909.80MHz; The maximum conducted is 28.49 dBm. The maximum gain is 2.00 dBi. Therefore, maximum limit for general public RF exposure: 1.00 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.22 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 1.00 mW/cm^2 limit for uncontrolled exposure.

5.6. Result of EGPRS 850 4TX

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.20 MHz～848.80 MHz; The maximum conducted is 23.99 dBm. The maximum gain is 3.50 dBi. Therefore, maximum limit for general public RF exposure: 824.20/1500=0.55 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.11 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.55 mW/cm^2 limit for uncontrolled exposure.

5.7. Result of EGPRS 1900 4TX

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1850.20 MHz～1909.80MHz; The maximum conducted is 24.49 dBm. The maximum gain is 2.00 dBi. Therefore, maximum limit for general public RF exposure: 1.00 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.09 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 1.00 mW/cm^2 limit for uncontrolled exposure.

5.8. Result of CAT-M1 Band 2

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1850.0 MHz～1909.9MHz; The maximum conducted is 25.00dBm. The maximum gain is 2.00 dBi. Therefore, maximum limit for general public RF exposure: 1.00 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.10 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 1.00 mW/cm^2 limit for uncontrolled exposure.

5.9. Result of CAT-M1 Band 4

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1710.0 MHz～1754.9MHz; The maximum conducted is 25.00 dBm. The maximum gain is 4.00 dBi. Therefore, maximum limit for general public RF exposure: 1.00 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.16 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 1.00 mW/cm^2 limit for uncontrolled exposure.

5.10. Result of CAT-M1 Band 5

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.0 MHz～848.9 MHz; The maximum conducted is 25.00 dBm. The maximum gain is 3.50 dBi. Therefore, maximum limit for general public RF exposure: 824.00/1500=0.55 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.14 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.55 mW/cm^2 limit for uncontrolled exposure.

5.11. Result of CAT-M1 Band 12

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 699.00 MHz～715.90 MHz; The maximum conducted is 25.00 dBm. The maximum gain is 4.00 dBi. Therefore, maximum limit for general public RF exposure: 699.00/1500=0.47 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.16 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.47 mW/cm^2 limit for uncontrolled exposure.

5.12. Result of CAT-M1 Band 13

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 777.00 MHz～786.90 MHz; The maximum conducted is 24.00 dBm. The maximum gain is 4.00 dBi. Therefore, maximum limit for general public RF exposure: 777.00/1500=0.52 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.13 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.52 mW/cm^2 limit for uncontrolled exposure.

5.13. Result of CAT-M1 Band 26（814.00 MHz～824.00 MHz）

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 814.00 MHz～824.00 MHz; The maximum conducted is 25.00 dBm. The maximum gain is 4.00 dBi. Therefore, maximum limit for general public RF exposure: 814/1500=0.54 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.16 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.54 mW/cm^2 limit for uncontrolled exposure.

5.14. Result of CAT-M1 Band 26（824.00 MHz～849.00 MHz）

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.00 MHz～849.00 MHz; The maximum conducted is 25.00 dBm. The maximum gain is 3.50 dBi. Therefore, maximum limit for general public RF exposure: 824/1500=0.55 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.14 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.55 mW/cm^2 limit for uncontrolled exposure.

5.15. Result of NB-IoT Band 2

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1850.0 MHz～1909.9MHz; The maximum conducted is 23.00 dBm. The maximum gain is 2.00 dBi. Therefore, maximum limit for general public RF exposure: 1.00 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.06 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 1.00 mW/cm^2 limit for uncontrolled exposure.

5.16. Result of NB-IoT Band 4

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 1710.0 MHz～1754.9MHz; The maximum conducted is 23.50 dBm. The maximum gain is 2.00 dBi. Therefore, maximum limit for general public RF exposure: 1.00 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.07 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 1.00 mW/cm^2 limit for uncontrolled exposure.

5.17. Result of NB-IoT Band 5

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.0 MHz～848.9 MHz; The maximum conducted is 23.00 dBm. The maximum gain is 3.50 dBi. Therefore, maximum limit for general public RF exposure: 824.00/1500=0.55 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.09 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.55 mW/cm^2 limit for uncontrolled exposure.

5.18. Result of NB-IoT Band 12

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 699.00 MHz～715.90 MHz; The maximum conducted is 23.00 dBm. The maximum gain is 4.00 dBi. Therefore, maximum limit for general public RF exposure: 699.00/1500=0.47 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.10 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.47 mW/cm^2 limit for uncontrolled exposure.

5.19. Result of NB-IoT Band 13

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 777.00 MHz～786.90 MHz; The maximum conducted is 23.00 dBm. The maximum gain is 4.00 dBi. Therefore, maximum limit for general public RF exposure: 777.00/1500=0.52 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.10 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.52 mW/cm^2 limit for uncontrolled exposure.

5.20. Result of NB-IoT Band 26（814.00 MHz～824.00 MHz）

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 814.00 MHz～824.00 MHz; The maximum conducted is 12.00 dBm. The maximum gain is 4.00 dBi. Therefore, maximum limit for general public RF exposure: 814/1500=0.54 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.01 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.54 mW/cm^2 limit for uncontrolled exposure.

5.21. Result of NB-IoT Band 26（824.00 MHz～849.00 MHz）

Test Results: MPE Limit Calculation: the EUT'S operating frequencies @ 824.00 MHz～849.00 MHz; The maximum conducted is 23.00 dBm. The maximum gain is 3.50 dBi. Therefore, maximum limit for general public RF exposure: 824/1500=0.55 mW/cm^2.

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

P= input power of the antenna（mW）

G = antenna gain（numeric）

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

S=0.09 mW/cm^2

Therefore, at 20 cm the spectral power density is less than the 0.55 mW/cm^2 limit for uncontrolled exposure.

ANNEX A: EUT photograph

See the document”IoT Module Photos”.

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