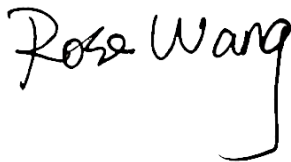


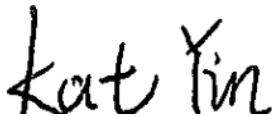
RF Exposure Evaluation Report

APPLICANT : Shanghai Smawave Technology Co., Ltd
EQUIPMENT : LTE Module
BRAND NAME : smawave
MODEL NAME : MG401
FCC ID : 2AU8H-MG401
STANDARD : 47 CFR Part 2.1091
FCC KDB 447498 D01 v06

We, Sporton International (Kunshan) Inc., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.



Reviewed by: Rose Wang / Supervisor



Approved by: Kat Yin / Manager



Sporton International (Kunshan) Inc.

No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province
215300 People's Republic of China



Table of Contents

1. ADMINISTRATION DATA	4
1.1. Testing Laboratory	4
2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	5
3. MAXIMUM RF AVERAGE OUTPUT POWER AMONG PRODUCTION UNITS	6
4. RF EXPOSURE LIMIT INTRODUCTION	7
5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	8
5.1. Standalone Power Density Calculation	8
5.2. Collocated Power Density Calculation.....	9



Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA033107	Rev. 01	Initial issue of report	May 22, 2020



1. Administration Data

1.1. Testing Laboratory

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory		
Test Firm	Sporton International (Kunshan) Inc.	
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958	
Test Site No.	FCC Designation No.	FCC Test Firm Registration No.
	CN1257	314309

Applicant	
Company Name	Shanghai Smawave Technology Co., Ltd
Address	3/F, Building 8, 1001 North Qinzhou Road, Xuhui District, Shanghai, China

Manufacturer	
Company Name	Shanghai Smawave Technology Co., Ltd
Address	3/F, Building 8, 1001 North Qinzhou Road, Xuhui District, Shanghai, China



2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	LTE Module
Brand Name	smawave
Model Name	MG401
FCC ID	2AU8H-MG401
Wireless Technology and Frequency Range	LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 790.5 MHz ~ 795.5 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 25: 1850.7 MHz ~ 1914.3 MHz LTE Band 26: 814.7 MHz ~ 848.3 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz LTE Band 42: 3552.5 MHz ~ 3597.5 MHz LTE Band 43: 3602.5 MHz ~ 3697.5 MHz LTE Band 48: 3552.5 MHz ~ 3697.5 MHz LTE Band 66: 1710.7 MHz ~ 1779.3 MHz
Mode	LTE: QPSK, 16QAM
Antenna Type	PCB Antenna
HW Version	V1.2
SW Version	CAT4_GS_BYPASS_0.3.3.2_V1.4
EUT Stage	Identical Prototype

Remark:

1. LTE band 42/43 covered by LTE band 48 with the same power level, so only chose LTE band 48 to perform standalone power density calculation.
2. This is a change FCC ID report, the change has no influence on the test results, all test cases were quoted on original report which can be referred to Sporton report number FA022705 (FCC ID: 2ASRY-MG401).



3. Maximum RF average output power among production units

Mode		Maximum Average power(dBm)
LTE	Band 2	25.00
	Band 4	25.00
	Band 5	24.00
	Band 12	24.00
	Band 13	25.00
	Band 14	25.00
	Band 17	24.00
	Band 25	25.00
	Band 26	22.00
	Band 41	25.00
	Band 42	24.00
	Band 43	24.00
	Band 48	24.00
Band 66	25.00	



4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

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

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

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

Where:

- S = Power Density
- P = Output Power at Antenna Terminals
- G = Gain of Transmit Antenna (linear gain)
- R = Distance from Transmitting Antenna

5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)
LTE Band 2	1850.7	8.00	25.00	33.00	1995.26	0.397	1.000
LTE Band 4	1710.7	5.00	25.00	30.00	1000.00	0.199	1.000
LTE Band 5	824.7	6.00	24.00	30.00	1000.00	0.199	0.550
LTE Band 12	699.7	5.00	24.00	29.00	794.33	0.158	0.466
LTE Band 13	779.5	5.00	25.00	30.00	1000.00	0.199	0.520
LTE Band 14	790.5	5.00	25.00	30.00	1000.00	0.199	0.527
LTE Band 17	706.5	5.00	24.00	29.00	794.33	0.158	0.471
LTE Band 25	1850.7	8.00	25.00	33.00	1995.26	0.397	1.000
LTE Band 26	814.7	6.00	22.00	28.00	630.96	0.126	0.543
LTE Band 41	2498.5	5.00	25.00	30.00	1000.00	0.199	1.000
LTE Band 48	3552.5	6.00	24.00	30.00	1000.00	0.199	1.000
LTE Band 66	1710.7	5.00	25.00	30.00	1000.00	0.199	1.000

Note:

1. LTE band 42/43 covered by LTE band 48 with the same power level, so only chose LTE band 48 to perform standalone power density calculation.



5.2. Collocated Power Density Calculation

General Note:

- 1. This MPE analysis is applicable to any collocated transmitters with EIRP for WLAN is less than or equal to 28.0dBm and EIRP for Bluetooth is less than or equal to 20.0dBm.
- 2. A maximum antenna gain of 5dBi for WLAN/BT has been assumed for all collocated antennas.

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
LTE Band 2	1850.7	7.00	25.00	32.00	1584.89	0.315	1.000	0.315
LTE Band 4	1710.7	5.00	25.00	30.00	1000.00	0.199	1.000	0.199
LTE Band 5	824.7	5.00	24.00	29.00	794.33	0.158	0.550	0.288
LTE Band 12	699.7	3.00	24.00	27.00	501.19	0.100	0.466	0.214
LTE Band 13	779.5	3.00	25.00	28.00	630.96	0.126	0.520	0.242
LTE Band 14	790.5	3.00	25.00	28.00	630.96	0.126	0.527	0.238
LTE Band 17	706.5	3.00	24.00	27.00	501.19	0.100	0.471	0.212
LTE Band 25	1850.7	7.00	25.00	32.00	1584.89	0.315	1.000	0.315
LTE Band 26	814.7	5.00	22.00	27.00	501.19	0.100	0.543	0.184
LTE Band 41	2498.5	5.00	25.00	30.00	1000.00	0.199	1.000	0.199
LTE Band 48	3552.5	6.00	24.00	30.00	1000.00	0.199	1.000	0.199
LTE Band 66	1710.7	5.00	25.00	30.00	1000.00	0.199	1.000	0.199
WLNA2.4GHz Band	2412	5.00	23.00	28.00	630.96	0.126	1.000	0.126
WLNA5GHz Band	5180	5.00	23.00	28.00	630.96	0.126	1.000	0.126
Bluetooth	2402	5.00	15.00	20.00	100.00	0.020	1.000	0.020



<Collocated analysis>

General Note:

- 1. For collocation analysis, LTE Band 2 is chosen for summation due to the highest (power density/limit) among all WWAN wireless modes.
- 2. $\Sigma(\text{Power Density / Limit})$: This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + WLAN + Bluetooth
- 3. Considering the WWAN module collocation with the other transmitters of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant.

Max WWAN Power Density / Limit	Max WLAN Power Density / Limit	Max Bluetooth Power Density / Limit	$\Sigma(\text{Power Density / Limit})$ of WWAN + WLAN + Bluetooth
0.315	0.126	0.020	0.461



Conclusion:

Based on 47 CFR §2.1091 and FCC KDB 447498 D01 v06, the analysis concludes that this product when transmitting in standalone within a host device, is compliant with the FCC RF exposure requirements in mobile exposure condition, provided the conducted power and antenna gain do not exceed the limits for each given frequency band per wireless technology as follow table:

Device	Technology	Frequency (MHz)	Maximum Conducted Power (dBm)	Stanalone Maximum Antenna Gain (dBi)	Collocated Maximum Antenna Gain (dBi)
MG401	LTE Band 2	1850.7	25.00	8.00	7.00
	LTE Band 4	1710.7	25.00	5.00	5.00
	LTE Band 5	824.7	24.00	6.00	5.00
	LTE Band 12	699.7	24.00	5.00	3.00
	LTE Band 13	779.5	25.00	5.00	3.00
	LTE Band 14	790.5	25.00	5.00	3.00
	LTE Band 17	706.5	24.00	5.00	3.00
	LTE Band 25	1850.7	25.00	8.00	7.00
	LTE Band 26	814.7	22.00	6.00	5.00
	LTE Band 41	2498.5	25.00	5.00	5.00
	LTE Band 48	3552.5	24.00	6.00	6.00
	LTE Band 66	1710.7	25.00	5.00	5.00
Collocated Transmitters	WLNA 2.4GHz Band	2412	23.00	/	5.00
	WLNA 5GHz Band	5180	23.00		5.00
	Bluetooth	2402	15.00		5.00