

**Shenzhen Global Test Service Co.,Ltd.**

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RF Exposure evaluation**Report Reference No..... : GTSR15080020-MPE****FCC ID..... : 2AFQFYC01**

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Date of issue.....: Sep. 11, 2015

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No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District,
Shenzhen, Guangdong**Testing Laboratory Name : Shenzhen CTL Testing Technology Co., Ltd**Address: 1/F.-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan
District, Shenzhen, Guangdong, China**Applicant's name.....: Shenzhen FuJinYing Electronic Co.,Ltd**Address: 4F-B, Block 3 of Fuda Industrial Park, No.68 YuanLing Ave,
ShangWu Community, ShiYan Avenue, BaoAn District, Shenzhen
city, GuangDong Prov, China**Test specification :**Standard: **47CFR §1.1310**Standard: **47CFR §2.1091**Standard: **KDB447498 v05r02**

TRF Originator.....: Shenzhen Global Test Service Co.,Ltd.

Master TRF.....: Dated 2014-12

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Test item description: Stick Computer

Trade Mark: /

Manufacturer: **Shenzhen FuJinYing Electronic Co.,Ltd**

Model/Type reference.....: YC-01

Listed Models: /

Modulation Type.....: GFSK,II/4DQPSK,8DPSK

Operation Frequency.....: From 2402MHz to 2480MHz

Exposure category.....: General population/uncontrolled environment

EUT Type: Production Unit

Device Type.....: Mobile Device

Rating: DC 5.0V from Adapter AC 120V/60Hz

Result.....: **PASS**

TEST REPORT

Test Report No. : GTSR15080020-MPE	Sep. 10, 2015 Date of issue
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Equipment under Test : Stick Computer

Model /Type : YC-01

Listed Models : /

Applicant : **Shenzhen FuJinYing Electronic Co.,Ltd**

Address : 4F-B, Block 3 of Fuda Industrial Park, No.68 YuanLing Ave, ShangWu Community, ShiYan Avenue, BaoAn District, Shenzhen city, GuangDong Prov, China

Manufacturer : **Shenzhen FuJinYing Electronic Co.,Ltd**

Address : 4F-B, Block 3 of Fuda Industrial Park, No.68 YuanLing Ave, ShangWu Community, ShiYan Avenue, BaoAn District, Shenzhen city, GuangDong Prov, China

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. SUMMARY

1.1. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/

1.2. Note

1. The EUT is a stick computer with WLAN and Bluetooth function, The functions of the EUT listed as below:

	Test Standards	Reference Report
WLAN	FCC Part 15 Subpart C	GTSR15080020-WLAN
Bluetooth-EDR	FCC Part 15 Subpart C	GTSR15080020-EDR
Bluetooth-BLE	FCC Part 15 Subpart C	GTSR15080020- BLE
MPE	FCC Per 47 CFR 2.1093(d)	GTSR15080020-MPE

2. TEST ENVIRONMENT

2.1. Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd

1/F.-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, Guangdong, China

2.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 964637

Shenzhen Global Test Service Co.,Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 964637, Jul 24, 2015.

2.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

2.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen CTL Testing Technology Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen CTL Testing Technology Co., Ltd is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

3. Method of measurement

3.1. Applicable Standard

According to §1.1307(b)(1), 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 of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

KDB447498 v05r02: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

3.2. Requirement

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3.3. Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
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 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 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

3.4. Conducted Power Results

WiFi

Mode	Channel	Frequency (MHz)	Worst case Data rate	Conducted Output Power (dBm)	
				Peak	Average
802.11b	1	2412	1Mbps	22.45	17.54
	6	2437	1Mbps	22.50	17.64
	11	2462	1Mbps	22.15	17.41
802.11g	1	2412	6Mbps	23.54	15.34
	6	2437	6Mbps	23.65	15.65
	11	2462	6Mbps	23.15	15.62
802.11n HT20	1	2412	6.5 Mbps	23.24	14.21
	6	2437	6.5 Mbps	23.34	14.34
	11	2462	6.5 Mbps	23.10	14.11
802.11n HT40	3	2422	13.5 Mbps	21.15	13.12
	6	2437	13.5 Mbps	21.32	13.32
	9	2452	13.5 Mbps	21.26	13.20

BT

Mode	Channel	Frequency (MHz)	Data rate	Conducted Output Power (dBm)	
				Peak	Average
GFSK-LE	00	2402	1 Mbps	-1.43	-2.41
	19	2440	1 Mbps	-1.63	-2.68
	39	2480	1 Mbps	-2.19	-3.07
GFSK	00	2402	1 Mbps	1.91	1.02
	39	2441	1 Mbps	1.89	0.98
	78	2480	1 Mbps	2.23	1.27
π/4DQPSK	00	2402	2 Mbps	1.25	0.56
	39	2441	2 Mbps	1.31	0.63
	78	2480	2 Mbps	1.68	0.82
8DPSK	00	2402	3 Mbps	1.35	0.59
	39	2441	3 Mbps	1.31	0.60
	78	2480	3 Mbps	1.16	0.37

Manufacturing tolerance

WiFi

IEEE 802.11b (Average)			
Frequency	2412	2437	2462
Target (dBm)	17.0	17.0	17.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11g (Average)			
Frequency	2412	2437	2462
Target (dBm)	15.0	15.0	15.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Frequency	2412	2437	2462
Target (dBm)	14.0	14.0	14.0
Tolerance ±(dB)	1.0	1.0	1.0
IEEE802.11n HT40 (Average)			
Frequency	2422	2437	2452
Target (dBm)	13.0	13.0	13.0
Tolerance ±(dB)	1.0	1.0	1.0

BT

GFSK-LE (Average)			
Frequency	2402	2440	2480
Target (dBm)	-3.0	-3.0	-3.0
Tolerance ±(dB)	1.0	1.0	1.0
GFSK (Average)			
Frequency	2402	2441	2480
Target (dBm)	1.0	1.0	1.0
Tolerance ±(dB)	1.0	1.0	1.0
π/4DQPSK(Average)			
Frequency	2402	2441	2480
Target (dBm)	0.0	0.0	0.0
Tolerance ±(dB)	1.0	1.0	1.0
8DPSK (Average)			
Frequency	2402	2441	2480
Target (dBm)	0.0	0.0	0.0
Tolerance ±(dB)	1.0	1.0	1.0

3.5. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

As declared by the Applicant, the EUT transmits with the maximum source-based Duty Cycle of 100%-see the User manual, and the EUT is a wireless device used in a mobile application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum mobile separation distance, $r=20\text{cm}$, as well as the gain of the used antenna is 2.0dBi for WLAN and BT, and the power drift from Turn-up Procedure provide by manufacturer as following states, the RF power density can be obtained..

4. Test Result

3.4.1 Standalone MPE

For 802.11b

Test Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (Turn-up Procedure)		Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit (mW/cm ²)	Test Results
		dBm	mW				
2412	20.00	18.00	63.0957	1.5849	0.0199	1.0000	PASS
2437	20.00	18.00	63.0957	1.5849	0.0199	1.0000	PASS
2462	20.00	18.00	63.0957	1.5849	0.0199	1.0000	PASS

For 802.11g

Test Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (Turn-up Procedure)		Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit (mW/cm ²)	Test Results
		dBm	mW				
2412	20.00	16.00	39.8107	1.5849	0.0126	1.0000	PASS
2437	20.00	16.00	39.8107	1.5849	0.0126	1.0000	PASS
2462	20.00	16.00	39.8107	1.5849	0.0126	1.0000	PASS

For 802.11n HT20

Test Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (Turn-up Procedure)		Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit (mW/cm ²)	Test Results
		dBm	mW				
2412	20.00	15.00	31.6228	1.5849	0.0100	1.0000	PASS
2437	20.00	15.00	31.6228	1.5849	0.0100	1.0000	PASS
2462	20.00	15.00	31.6228	1.5849	0.0100	1.0000	PASS

For 802.11n HT40

Test Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (Turn-up Procedure)		Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit (mW/cm ²)	Test Results
		dBm	mW				
2422	20.00	14.00	25.1189	1.5849	0.0079	1.0000	PASS
2437	20.00	14.00	25.1189	1.5849	0.0079	1.0000	PASS
2452	20.00	14.00	25.1189	1.5849	0.0079	1.0000	PASS

For GFSK-LE

Test Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (Turn-up Procedure)		Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit (mW/cm ²)	Test Results
		dBm	mW				
2402	20.00	-2.00	0.6310	1.5849	0.0002	1.0000	PASS
2440	20.00	-2.00	0.6310	1.5849	0.0002	1.0000	PASS
2480	20.00	-2.00	0.6310	1.5849	0.0002	1.0000	PASS

For GFSK

Test Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (Turn-up Procedure)		Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit (mW/cm ²)	Test Results
		dBm	mW				
2402	20.00	2.00	1.5849	1.5849	0.0005	1.0000	PASS
2441	20.00	2.00	1.5849	1.5849	0.0005	1.0000	PASS
2480	20.00	2.00	1.5849	1.5849	0.0005	1.0000	PASS

For $\pi/4$ DQPSK

Test Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (Turn-up Procedure)		Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit (mW/cm ²)	Test Results
		dBm	mW				
2402	20.00	1.00	1.2589	1.5849	0.0004	1.0000	PASS
2441	20.00	1.00	1.2589	1.5849	0.0004	1.0000	PASS
2480	20.00	1.00	1.2589	1.5849	0.0004	1.0000	PASS

For 8DPSK

Test Frequency (MHz)	Minimum Separation Distance (cm)	Output Power (Turn-up Procedure)		Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit (mW/cm ²)	Test Results
		dBm	mW				
2402	20.00	1.00	1.2589	1.5849	0.0004	1.0000	PASS
2441	20.00	1.00	1.2589	1.5849	0.0004	1.0000	PASS
2480	20.00	1.00	1.2589	1.5849	0.0004	1.0000	PASS

3.4.2 Simultaneous transmission MPE Considerations

According to KDB447498 :For mobile exposure host platform to qualify for simultaneous transmission MPE test exclusion, all transmitters and antennas in the host must be either evaluated for MPE compliance, by measurement or computational modeling, or qualify for the standalone MPE test exclusion in section 7.1. Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 .

This means that:

$\sum$ of MPE ratios ≤ 1.0

The WiFi and BT modular share same antenna, without any simultaneous transmission, so not need consider simultaneous transmission.

5. Conclusion

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

.....**End of Report**.....