

FCC RF EXPOSURE EVALUATION REPORT

FCC ID: 2AC23-WT21M2610

Project No. : 1808C159A

Equipment : WIFI+BT Module

Model : WT21M2610

Applicant : Hui Zhou Gaoshengda Technology Co.,LTD

Address : NO.75 Zhongkai Development Area, Huizhou,
Guangdong

Exposure category : General population/uncontrolled environment

EUT Type: : Production Unit (Engineer Sample)

Device Type : Mobile Device

1. Evaluation Method

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.

2. Limits for General Population/Uncontrolled Exposure

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

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

3. Refer Evaluation Method

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1093](#): Radiofrequency radiation exposure evaluation: portable devices

4. 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

5. Conducted Power Results

5.1 Test Setup



5.2 Test Equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	ANRITSU	ML2495A	1128009	Mar.11, 2019
2	Pulse Power Sensor	ANRITSU	MA2411B	1027500	Mar.11, 2019

Remark: all calibration period of equipment list is one year.

5.3 Test Procedure

- The EUT was directly connected to the power meter and antenna output port as show in the block diagram Test Setup.
- Setup EUT work at duty cycle more than 98%;
- Read power sensor values in peak detector;

5.4 Test Results and Manufacturing Tolerance

Mode	Maximum peak power declared by Manufacturer	
	Antenna 1	
GFSK	≤ 5.50	
8DPSK	≤ 4.50	
GFSK – BT LE(1Mbps)	≤ 13.00	
GFSK – BT LE(2 Mbps)	≤ 12.50	
Mode	Maximum Average power declared by Manufacturer	
	Antenna 2	Antenna 3
IEEE 802.11b	≤ 14.00	≤ 14.00
IEEE 802.11g	≤ 20.00	≤ 20.00
IEEE 802.11n HT20	≤ 20.00	≤ 21.00
IEEE 802.11n HT40	≤ 21.00	≤ 22.00

6. Antenna Information

Antenna	Manufacturer	Model Name	Antenna Type	Connector	Maximum Peak Gain (dBi)
Antenna 1	SHENZHEN ZHONGTIAN XUN Communication Technology Co.,Ltd.	WC0D-60	PIFA	R-SMA	1.72
Antenna 2	SHENZHEN ZHONGTIAN XUN Communication Technology Co.,Ltd.	1.01.00451	PIFA	N/A	2.0
Antenna 3	SHENZHEN ZHONGTIAN XUN Communication Technology Co.,Ltd.	1.01.00452	PIFA	N/A	2.0

7. Evaluation Results

7.1 Standalone Evaluation

[Antenna 1]

Mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	(dBm)	(mW)					
GFSK	5.50	0.0036	1.72	1.4859	100%	0.0010	1.0000
8DPSK	4.50	0.0028	1.72	1.4859	100%	0.0008	1.0000
GFSK – BT LE(1Mbps)	13.00	0.0200	1.72	1.4859	100%	0.0059	1.0000
GFSK – BT LE(2Mbps)	12.50	0.0185	1.72	1.4859	100%	0.0053	1.0000

[Antenna 2]

Mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	(dBm)	(mW)					
IEEE 802.11b	14.00	25.1189	2.00	1.5849	100%	0.0079	1.0000
IEEE 802.11g	20.00	100.0000	2.00	1.5849	100%	0.0315	1.0000
IEEE 802.11n HT20	20.00	100.0000	2.00	1.5849	100%	0.0315	1.0000
IEEE 802.11n HT40	21.00	125.8925	2.00	1.5849	100%	0.0397	1.0000

[Antenna 3]

Mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	(dBm)	(mW)					
IEEE 802.11b	14.00	25.1189	2.00	1.5849	100%	0.0079	1.0000
IEEE 802.11g	20.00	100.0000	2.00	1.5849	100%	0.0315	1.0000
IEEE 802.11n HT20	21.00	125.8925	2.00	1.5849	100%	0.0397	1.0000
IEEE 802.11n HT40	22.00	158.4893	2.00	1.5849	100%	0.0500	1.0000

Remark:

1. Maximum power including tune-up tolerance;
2. EIRP including tune-up tolerance;
3. MPE use distance is 20cm from manufacturer declaration of user manual.

7.2

Simultaneous Transmission MPE Evaluation

The sample supports 2T2R MIMO technology for WLAN and one antenna for BT, WLAN and BT share difference antenna, need consider simultaneous transmission.

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

$\sum$ of MPE ratios ≤ 1.0

7.2.1 Summary simultaneous transmission information

Modulation Type	Work Frequency Band	Transmit Antenna			Antenna 2 Antenna 3 Synchronization transmit	Antenna 1 Antenna 2 Antenna 3 Synchronization transmit
		Antenna 1	Antenna 2	Antenna 3		
BT*	2.4 GHz	Yes	No	No	No	Yes
IEEE 802.11b	2.4 GHz	No	Yes	Yes	No	
IEEE 802.11g	2.4 GHz	No	Yes	Yes	No	
IEEE 802.11n HT20	2.4 GHz	No	Yes	Yes	Yes	
IEEE 802.11n HT40	2.4 GHz	No	Yes	Yes	Yes	

BT* - Including BT Classics and BT LE;

7.2.2 Summary simultaneous transmission results

MPE _{Antenna 1} Ratios	MPE _{Antenna 2} Ratios	MPE _{Antenna 3} Ratios	Σ MPE ratios	Limit	Results
0.0010	0.0397	0.0500	0.1	1.0	PASS

8. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06.

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