

MPE TEST REPORT

FCC Per 47 CFR 2.1091(b)

Report Reference No.....: A150J166117-MPE

FCC ID.....: 2AE4C-M210

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Date of issue.....: July 28, 2015

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Testing Laboratory Name: Dongguan Dongdian Testing Service Co.,Ltd

Address.....: No.17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China

Applicant's name.....: HwaCom Systems Inc.

Address.....: 11Fl., No.108, Sec. 1, Hsin-Tai-Wu Rd., Hsi-Chih District, New Taipei City 221, Taiwan, R.O.C.

Test specification:

Standard: FCC Per 47 CFR 2.1091(b)

KDB447498 v05r02

TRF Originator: Shenzhen CTL Electron Technology Co., Ltd.

Master TRF: Dated 2012-06

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Test item description: IP Set top box

Trade Mark: HawCom

Model/Type reference.....: M210

Listed Models: HC-J3600

Manufacturer: Zhuhai Gotech Intelligent Technology Co., Ltd.

Rating: DC 12.0V Adapter from AC 120V/60Hz

Device Type.....: Mobile Device

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

EUT Type.....: Production Unit

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

MPE T E S T R E P O R T

Test Report No. :	A150J166117-MPE	July 28, 2015
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Equipment under Test : IP Set top box

Model /Type : M210

Listed Models : HC-J3600

Applicant : **HwaCom Systems Inc.**

Address : 11Fl., No.108, Sec. 1, Hsin-Tai-Wu Rd., Hsi-Chih District, New Taipei City 221, Taiwan, R.O.C.

Manufacturer **Zhuhai Gotech Intelligent Technology Co., Ltd.**

Address : 66 Yongda Road, Hongqi Town, Jinwan District, Zhuhai, 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

<input type="radio"/>	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
<input type="radio"/>	Multimeter	Manufacturer :	/
		Model No. :	/

1.2. NOTE

1. The EUT is a IP Set top box with WLAN and Bluetooth function, The functions of the EUT listed as below:

	Test Standards	Reference Report
WLAN-2.4GHz	FCC Part 15 Subpart C	A150J166117-WLAN1
WLAN-5.8GHz	FCC Part 15 Subpart E	A150J166117-WLAN2
Bluetooth-EDR	FCC Part 15 Subpart C	A150J166117-EDR
Bluetooth-BLE	FCC Part 15 Subpart C	A150J166117-BLE
MPE	FCC Per 47 CFR 2.1091(b)	A150J166117-MPE

2. The frequency bands used in this EUT are listed as follows:

Frequency Band(MHz)	2400-2483.5	5150-5350	5470-5725	5725-5850
802.11a	—	✓	—	✓
802.11b	✓	—	—	—
802.11g	✓	—	—	—
802.11n HT20MHz	✓	✓	—	✓
802.11n HT40MHz	—	—	—	—

3. The EUT incorporates a SISO function, physically; the EUT provides one completed transmitter and one completed receiver.

Modulation Mode	TX Function
802.11a	1TX
802.11b	1TX
802.11g	1TX
802.11n HT20MHz	1TX
802.11n HT40MHz	—

2. TEST ENVIRONMENT

2.1. Address of the test laboratory

Dongguan Dongdian Testing Service Co.,Ltd.

No.17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2003) and CISPR Publication 22.

2.2. Test Facility

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

IC Registration No.: 10288A-1

The 3m alternate test site of Dongguan Dongdian Testing Service Co.,Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 10288A-1 on May, 2012.

FCC-Registration No.: 270092

Dongguan Dongdian Testing 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 270092, Mar, 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 CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Dongguan Dongdian Testing Service 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 Dongguan Dongdian Testing Service Co.,Ltd laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.16 dB	(1)
Radiated Emission	1~18GHz	2.56 dB	(1)
Radiated Emission	18-40GHz	2.56 dB	(1)
Conducted Disturbance	0.15~30MHz	2.44 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

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

Mode	Channel	Frequency (MHz)	Worst case Data rate	Conducted Output Power (dBm)	
				Peak	Average
802.11a	36	5180	6Mbps	18.54	12.20
	40	5200	6Mbps	19.00	12.57
	48	5220	6Mbps	19.20	12.74
	149	5745	6Mbps	19.91	13.47
	157	5785	6Mbps	19.41	13.28
	165	5825	6Mbps	20.01	13.46
802.11b	1	2412	1Mbps	16.56	13.99
	6	2437	1Mbps	16.89	14.22
	11	2462	1Mbps	15.66	13.16
802.11g	1	2412	6Mbps	20.81	12.75
	6	2437	6Mbps	21.09	13.04
	11	2462	6Mbps	19.94	11.99
802.11n HT20	1	2412	6.5 Mbps	19.84	11.72
	6	2437	6.5 Mbps	20.14	12.06
	11	2462	6.5 Mbps	19.07	11.04
	36	5180	6.5 Mbps	18.21	11.78
	40	5200	6.5 Mbps	18.45	12.02
	48	5220	6.5 Mbps	18.77	12.09
	149	5745	6.5 Mbps	18.14	11.84
	157	5785	6.5 Mbps	18.49	12.27
	165	5825	6.5 Mbps	19.09	12.46

BT

Mode	Channel	Frequency (MHz)	Data rate	Conducted Output Power (dBm)	
				Peak	Average
GFSK-LE	00	2402	1 Mbps	-5.14	-6.61
	19	2440	1 Mbps	-5.27	-6.97
	39	2480	1 Mbps	-5.23	-6.82
GFSK	00	2402	1 Mbps	5.51	4.96
	39	2441	1 Mbps	5.96	5.24
	78	2480	1 Mbps	5.59	5.07
Π/4DQPSK	00	2402	2 Mbps	4.75	4.19
	39	2441	2 Mbps	5.18	4.58
	78	2480	2 Mbps	5.03	4.32
8DPSK	00	2402	3 Mbps	4.76	4.20
	39	2441	3 Mbps	5.24	4.66
	78	2480	3 Mbps	5.08	4.35

Manufacturing tolerance

WiFi			
802.11b (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	14.0	14.0	14.0
Tolerance ±(dB)	1.0	1.0	1.0
802.11g (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	12.0	12.0	12.0
Tolerance ±(dB)	1.0	1.0	1.0
802.11n HT20 (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	12.0	12.0	12.0
Tolerance ±(dB)	1.0	1.0	1.0
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	12.0	12.0	12.0
Tolerance ±(dB)	1.0	1.0	1.0

Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	12.0	12.0	12.0
Tolerance \pm (dB)	1.0	1.0	1.0
802.11a (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	12.0	12.0	12.0
Tolerance \pm (dB)	1.0	1.0	1.0
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	13.0	13.0	13.0
Tolerance \pm (dB)	1.0	1.0	1.0

BT			
GFSK-LE (Average)			
Channel	Channel 00	Channel 19	Channel 39
Target (dBm)	-6.0	-6.0	-6.0
Tolerance \pm (dB)	1.0	1.0	1.0
GFSK (Average)			
Channel	Channel 00	Channel 39	Channel 78
Target (dBm)	5.0	5.0	5.0
Tolerance \pm (dB)	1.0	1.0	1.0
II/4DQPSK(Average)			
Channel	Channel 00	Channel 39	Channel 78
Target (dBm)	4.0	4.0	4.0
Tolerance \pm (dB)	1.0	1.0	1.0
8DPSK (Average)			
Channel	Channel 00	Channel 39	Channel 78
Target (dBm)	4.0	4.0	4.0
Tolerance \pm (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 soure-baed 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 0.0dBi 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..

TEST RESULTS

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	15.00	31.6228	1.0000	0.0063	1.0000	PASS
2437	20.00	15.00	31.6228	1.0000	0.0063	1.0000	PASS
2462	20.00	15.00	31.6228	1.0000	0.0063	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	13.00	19.9526	1.0000	0.0039	1.0000	PASS
2437	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS
2462	20.00	13.00	19.9526	1.0000	0.0039	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	13.00	19.9526	1.0000	0.0039	1.0000	PASS
2437	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS
2462	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS
5180	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS
5200	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS
5220	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS
5745	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS
5785	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS
5825	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS

For 802.11a

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				
5180	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS
5200	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS
5220	20.00	13.00	19.9526	1.0000	0.0039	1.0000	PASS
5745	20.00	14.00	25.1189	1.0000	0.0050	1.0000	PASS
5785	20.00	14.00	25.1189	1.0000	0.0050	1.0000	PASS
5825	20.00	14.00	25.1189	1.0000	0.0050	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	-5.0	0.3162	1.0000	0.0001	1.0000	PASS
2440	20.00	-5.0	0.3162	1.0000	0.0001	1.0000	PASS
2480	20.00	-5.0	0.3162	1.0000	0.0001	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	6.0	3.9811	1.0000	0.0008	1.0000	PASS

2441	20.00	6.0	3.9811	1.0000	0.0008	1.0000	PASS
2480	20.00	6.0	3.9811	1.0000	0.0008	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	5.0	3.1623	1.0000	0.0006	1.0000	PASS
2441	20.00	5.0	3.1623	1.0000	0.0006	1.0000	PASS
2480	20.00	5.0	3.1623	1.0000	0.0006	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	5.0	3.1623	1.0000	0.0006	1.0000	PASS
2441	20.00	5.0	3.1623	1.0000	0.0006	1.0000	PASS
2480	20.00	5.0	3.1623	1.0000	0.0006	1.0000	PASS

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:

$$\sum \text{MPE ratios} \leq 1.0$$

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

4. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091(b) for the uncontrolled RF Exposure.

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