

RF Exposure Report

Report No.: SA141225E06

FCC ID: MCLT77H566

Test Model: T77H566

Received Date: Dec. 24, 2014

Test Date: Jan. 20 to 21, 2015

Issued Date: Feb. 10, 2015

Applicant: HON HAI PRECISION IND.CO.,LTD

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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Release Control Record

Issue No.	Description	Date Issued
SA141225E06	Original release.	Feb. 10, 2015



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1 Certificate of Conformity

Product: WiFi/BT Module

Brand: FOXCONN

Test Model: T77H566

Sample Status: ENGINEERING SAMPLE

Applicant: HON HAI PRECISION IND.CO.,LTD

Test Date: Jan. 20 to 21, 2015


Standards: FCC Part 2 (Section 2.1091)

KDB 447498 D03

IEEE C95.1

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :  , **Date:** Feb. 10, 2015
Lori Chung / Specialist

Approved by :  , **Date:** Feb. 10, 2015
May Chen / Manager

2 RF Exposure

2.1 Limits For Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
300-1500	F/1500	30
1500-100,000	1.0	30

F = Frequency in MHz

2.2 MPE Calculation Formula

$$P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$$

where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

2.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user.

So, this device is classified as **Mobile Device**.

3 Antenna Gain

The antennas provided to the EUT, please refer to the following table:

Antenna No	PCB Chain No.	Brand	Model	Gain (dBi)	Antenna Type	Connector Type	Frequency range (GHz to GHz)
1	Chain (0) Main	NA	NA	1.88	PCB	i-pex(MHF)	2.4~2483.5
				2.51			5.15~5.25
				2.27			5.25~5.35
				1.77			5.47~5.725
				1.54			5.725~5.825
2	Chain (1) Aux	NA	NA	1.73	PCB	i-pex(MHF)	2.4~2483.5
				3.02			5.15~5.25
				3.4			5.25~5.35
				2.48			5.47~5.725
				-0.16			5.725~5.825

Note: For Bluetooth configuration mode will fix transmission on Chain (0).

4 Calculation Result Of Maximum Conducted Power

For WLAN: 15.247(2.4GHz)

802.11b

FREQUENCY (MHz)	CONDUCTED POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm ²)	LIMIT (mW/cm ²)
2412 - 2462	231.739	1.88	20	0.06866	1

802.11g

FREQUENCY (MHz)	CONDUCTED POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm ²)	LIMIT (mW/cm ²)
2412 - 2462	378.935	4.82	20	0.22871	1

Note:

$$\text{Directional gain} = 10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.82\text{dBi}$$

802.11n (HT20)

FREQUENCY (MHz)	CONDUCTED POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm ²)	LIMIT (mW/cm ²)
2412 - 2462	344.836	4.82	20	0.20813	1

Note:

$$\text{Directional gain} = 10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.82\text{dBi}$$

For WLAN: 15.407(5GHz)

802.11a

FREQUENCY (MHz)	CONDUCTED POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm ²)	LIMIT (mW/cm ²)
5180 ~ 5240	156.507	5.78	20	0.06736	1
5260 ~ 5320	157.233	5.86	20	0.12058	1
5500 ~ 5700	160.175	5.14	20	0.10407	1
5745 ~ 5825	162.194	3.74	20	0.07634	1

Note:

5150~5250MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.78\text{dBi}$

5250~5350MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.86\text{dBi}$

5470~5725MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.14\text{dBi}$

5725~5825MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 3.74\text{dBi}$

802.11ac (VHT20)

FREQUENCY (MHz)	CONDUCTED POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm ²)	LIMIT (mW/cm ²)
5180 ~ 5240	155.437	5.78	20	0.11703	1
5260 ~ 5320	156.163	5.86	20	0.11976	1
5500 ~ 5700	112.032	5.14	20	0.07279	1
5745 ~ 5825	167.513	3.74	20	0.07885	1

Note:

5150~5250MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.78\text{dBi}$

5250~5350MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.86\text{dBi}$

5470~5725MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.14\text{dBi}$

5725~5825MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 3.74\text{dBi}$

802.11ac (VHT40)

FREQUENCY (MHz)	CONDUCTED POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm ²)	LIMIT (mW/cm ²)
5190 ~ 5230	142.577	5.78	20	0.10734	1
5270 ~ 5310	152.067	5.86	20	0.11662	1
5510 ~ 5670	154.719	5.14	20	0.10052	1
5755 ~ 5795	67.624	3.74	20	0.03183	1

Note:

5150~5250MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.78\text{dBi}$

5250~5350MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.86\text{dBi}$

5470~5725MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.14\text{dBi}$

5725~5825MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 3.74\text{dBi}$

802.11ac (VHT80)

FREQUENCY (MHz)	CONDUCTED POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm ²)	LIMIT (mW/cm ²)
5210	38.155	5.78	20	0.02873	1
5290	53.586	5.86	20	0.04109	1
5530 ~ 5690	125.758	5.14	20	0.08171	1
5775	25.063	3.74	20	0.01180	1

Note:

5150~5250MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.78\text{dBi}$

5250~5350MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.86\text{dBi}$

5470~5725MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.14\text{dBi}$

5725~5825MHz: Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 3.74\text{dBi}$

For Bluetooth:

GFSK

FREQUENCY (MHz)	CONDUCTED POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm ²)	LIMIT (mW/cm ²)
2402-2480	9.638	1.88	20	0.00296	1

8DPSK

FREQUENCY (MHz)	CONDUCTED POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm ²)	LIMIT (mW/cm ²)
2402-2480	5.957	1.88	20	0.00183	1

BT-LE (GFSK)

FREQUENCY (MHz)	CONDUCTED POWER (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm ²)	LIMIT (mW/cm ²)
2402-2480	3.776	1.88	20	0.00116	1

Conclusion:

Both of the Bluetooth and WLAN can transmit simultaneously, the formula of calculated the MPE is:

$$CPD_1 / LPD_1 + CPD_2 / LPD_2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

For 1x1 WLAN (2.4GHz) and Bluetooth:

Therefore, the worst-case situation is $0.22871 / 1 + 0.00296 / 1 = 0.232$, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

For 2x2 WLAN (5GHz) and Bluetooth:

Therefore, the worst-case situation is $0.12058 / 1 + 0.00296 / 1 = 0.124$, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

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