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Report On

RF Exposure Evaluation of the
Beijing HangRuiTuoYu Technology Co.,Ltd.
ZigBee Module of HRZB211

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FCC ID: 2AA43HRTYZB211

Document 57013141 Report 02 Issue 1 November 2013

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Document 57013141 Report 02 Issue 1

November 2013

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DATED

4 November 2013

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Part 1, 2. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

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RF Exposure Measurement

1 Introduction

This document was prepared to analyze the expected level of Radiofrequency Radiation Exposure caused by the radio transmission equipment ZigBee Module of HRZB211 belonging to Beijing HangRuiTuoYu Technology Co.,Ltd.

2 Limits and Guidelines on Maximum Permissible Exposure (MPE)

Based on Section FCC Part 1.1310, the requirements for the radiofrequency (RF) radiation exposure limits was specified in the following table:

TABLE 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)	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

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

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

3 Calculation of Output Power threshold for ZigBee Module of HRZB211

Below method describes a theoretical approach to compare the output power of the ZigBee Module of HRZB211 based on a typical configuration mobile device.

In accordance with 47CFR FCC Part 2.1091, the product was defined as a mobile device.

3.1 Typical Configuration of the ZigBee Module of HRZB211

The ZigBee Module of HRZB211 supports frequency band of 2400MHz - 2483.5MHz. It supports O-QPSK modulation with a bandwidth of 5MHz.

3.2 Antennas and Technical Description of ZigBee Module of HRZB211

Max. output power at antenna connector(dBm)	**Modulation Type**	**CH Bottom (2405MHz)**	**CH Middle (2445MHz)**	**CH Top (2480MHz)**
	O-QPSK	20.00	19.88	19.62
Transmitter frequency band	2400MHz -2483.5MHz			
The electric field strength at 3 meters	106.85dBμV/m			
Number of antenna ports	1			
Antenna 1 gain	2dBi			
Antenna 2 gain	3dBi			

3.3 Calculation result

This ZigBee Module device operate with distance d ≥ 20cm,
The maximum measured electric field strength at 3 meters is 106.85dBμV/m, so the EIRP=220.0mW

The limit for Maximum Permissible Exposure (MPE) for transmitter at 2.4GHz is 1.0mW/cm^2

The power density is related to EIRP with the equation:
$S = EIRP/4\pi D^2$ which equal to $S=220.0mW/4\pi D^2$, thus $D=400cm^2$
$S=0.044mW/cm^2$

The minimum safe separation distance D= 0.02cm.

The calculation result is below the limit of 1.0mW/cm^2.