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MPE Report

Test Report No.	:	1607FS12
Applicant	:	Wisdom Garden Hong Kong Limited
Product Type	:	Intelligent Space Management Terminal
Trade Name	:	ROOMIS
Model Number	:	RM1000
Date of Received	:	May 23, 2016
Test Period	:	May 25 ~ Jul. 06, 2016
Date of Issued	:	Jul. 15, 2016
Test Specification	:	ANSI / IEEE Std.C95.1-1992 / IEEE Std. 1528-2013
		47 CFR § 2.1091
		47 CFR § 1.1310
Location of Test Lab.	:	Chang-an Lab.

1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
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Approved By　　:　　_____　　Tested By　　:　　_____
　　　　　　　　　　　　　(Bill Hu)　　　　　　　　　　　　　　　　　(Mark Duan)

Contents

1. Description of Equipment under Test (EUT)

Applicant	Wisdom Garden Hong Kong Limited Room 502, Bank of America Tower,12 Harcourt Road, Central, Hong Kong
Manufacturer	Wisdom Garden Hong Kong Limited Room 502, Bank of America Tower,12 Harcourt Road, Central, Hong Kong
Product Type	Intelligent Space Management Terminal
Trade Name	ROOMIS
Model Number	RM1000
FCC ID	2AILZROOMIS10
Frequency Range	IEEE 802.11b / 802.11g / 802.11n 2.4GHz 20MHz : 2412 - 2462 MHz IEEE 802.11n 2.4GHz 40MHz : 2422 - 2452 MHz Bluetooth BR/EDR 2402 - 2480 MHz Bluetooth LE 2402 - 2480 MHz
Transmit Power (conducted power)	IEEE 802.11b: 0.084 W / 19.22 dBm IEEE 802.11g: 0.034 W / 15.27 dBm IEEE 802.11n 2.4GHz 20MHz : 0.033 W / 15.24 dBm IEEE 802.11n 2.4GHz 40MHz : 0.018 W / 12.59 dBm Bluetooth BR/EDR: 0.0010 W / 0.10 dBm Bluetooth LE: 0.0037 W / 5.69 dBm
Antenna Type	IPEX PCB Antenna
Antenna Gain	IEEE 802.11b, IEEE 802.11g: 1.92 dBi IEEE 802.11n 2.4GHz 20MHz / 40MHz: 1.92 dBi IEEE 802.11a, IEEE 802.11n 5GHz 20MHz / 40MHz: 1.92 dBi Bluetooth BR/EDR, Bluetooth LE: 1.92 dBi
Temperature Range	-10 ~ +50°C
RF Evaluation	0.28 mW/cm^2

The above equipment was tested by A Test Lab Techno Corp. For compliance with the requirements set forth in 47 CFR § 2.1091 / 47 CFR § 1.1310. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties

2. Human Exposure Assessment

Due to the design and installation of this product, it is not possible to conduct SAR evaluation. This is because client either manufactures or supplies the antenna(s) that will be used in the installation of this product. Therefore, this product will be evaluated as a mobile device per 47 CFR § 1.1310 titled "Radiofrequency radiation exposure limits", generally referred to as MPE limits.

In 47 CFR § 2.1091, paragraph (b) defines a mobile device as "a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 cm is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. " This product is intended to be installed into a vehicle such that the unit is physically secured at one location. In the installation guide supplied with the product,

Client has made the following statement: "IMPORTANT: To meet the FCC's RF Exposure Guidelines, the antenna should be installed so there is at least 20 cm of separation between the body of the user and nearby persons and the antenna". Based on the installation of the transceiver and the antenna, the transmitters radiating structure is more than 20 cm from the user. Thus, this product is a "mobile device" as defined in section § 2.1091 paragraph (b).

Exposure evaluation
$$S = \frac{PG}{4\pi R^2}$$ Where   S: power density   P: power input to the 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.

3. RF Output Power

The conducted power turn-up tolerance reference manufacturer specification.

Band	Date Rate	CH	Frequency (MHz)	Average Conducted power (dBm)
IEEE 802.11b	1M	1	2412.0	18.70
		6	2437.0	18.96
		11	2462.0	19.22
	2M	6	2437.0	18.93
	5.5M	6	2437.0	18.92
	11M	6	2437.0	18.90
IEEE 802.11g	6M	1	2412.0	14.62
		6	2437.0	15.02
		11	2462.0	15.27
	9M	6	2437.0	15.00
	12M	6	2437.0	14.85
	18M	6	2437.0	14.98
	24M	6	2437.0	14.93
	36M	6	2437.0	14.87
	48M	6	2437.0	14.90
	54M	6	2437.0	14.89
IEEE 802.11n 2.4GHz 20MHz	6.5M	1	2412.0	14.64
		6	2437.0	15.03
		11	2462.0	15.24
	13M	6	2437.0	15.00
	19.5M	6	2437.0	14.90
	26M	6	2437.0	14.87
	39M	6	2437.0	14.98
	52M	6	2437.0	14.93
	58.5M	6	2437.0	14.85
	65M	6	2437.0	14.95
IEEE 802.11n 2.4GHz 40MHz	13.5M	3	2422.0	12.26
		6	2437.0	12.42
		9	2452.0	12.59
	27M	6	2437.0	12.40
	40.5M	6	2437.0	12.29
	54M	6	2437.0	12.33
	81M	6	2437.0	12.38
	108M	6	2437.0	12.31
	121.5M	6	2437.0	12.26
	135M	6	2437.0	12.35

Band	CH	Frequency (MHz)	Packet Type	Average Conducted power (dBm)
Bluetooth BR GFSK	0	2402	DH1	5.58
			DH3	5.61
			DH5	5.63
	39	2441	DH1	5.65
			DH3	5.67
			DH5	5.69
	78	2480	DH1	5.17
			DH3	5.19
			DH5	5.22
Bluetooth EDR π/4-DQPSK	0	2402	2DH1	4.72
			2DH3	4.74
			2DH5	4.77
	39	2441	2DH1	4.84
			2DH3	4.86
			2DH5	4.89
	78	2480	2DH1	4.46
			2DH3	4.48
			2DH5	4.52
Bluetooth EDR 8DPSK	0	2402	3DH1	4.78
			3DH3	4.81
			3DH5	4.84
	39	2441	3DH1	4.89
			3DH3	4.92
			3DH5	4.94
	78	2480	3DH1	4.53
			3DH3	4.55
			3DH5	4.58
Bluetooth LE	0	2402	---	-0.10
	19	2440		0.10
	39	2480		-0.44

4. Test Result

Band	Data Rate	Frequency (MHz)	Limit (mw)	Distance [R] (cm)	Max tune-up Power (upper limit) [P] (dBm)	ANT Gain (dBi)	Numeric Gain [G]	Duty Cycle	[P] x [G] with Duty cycle [TP] (mW)	Power Density [S] (mw/cm²)
IEEE 802.11b	1M	2412.0	1.000	20	19.40	1.92	1.56	1	135.870	0.0270
		2437.0	1.000	20	19.40	1.92	1.56	1	135.870	0.0270
		2462.0	1.000	20	19.40	1.92	1.56	1	135.870	0.0270
IEEE 802.11g	6M	2412.0	1.000	20	15.40	1.92	1.56	1	54.090	0.0108
		2437.0	1.000	20	15.40	1.92	1.56	1	54.090	0.0108
		2462.0	1.000	20	15.40	1.92	1.56	1	54.090	0.0108
IEEE 802.11n 2.4GHz 20MHz	6.5M	2412.0	1.000	20	15.40	1.92	1.56	1	54.090	0.0108
		2437.0	1.000	20	15.40	1.92	1.56	1	54.090	0.0108
		2462.0	1.000	20	15.40	1.92	1.56	1	54.090	0.0108
IEEE 802.11n 2.4GHz 40MHz	13.5M	2422.0	1.000	20	12.70	1.92	1.56	1	29.050	0.0058
		2437.0	1.000	20	12.70	1.92	1.56	1	29.050	0.0058
		2452.0	1.000	20	12.70	1.92	1.56	1	29.050	0.0058

Band	Packet Type	Frequency (MHz)	Limit (mw)	Distance [R] (cm)	Max tune-up Power (upper limit) [P] (dBm)	ANT Gain (dBi)	Numeric Gain [G]	Duty Cycle	[P] x [G] with Duty cycle [TP] (mW)	Power Density [S] (mw/cm²)
Bluetooth BR/EDR	DH5	2402.0	1.000	20	5.80	1.92	1.56	1	5.930	0.0012
		2441.0	1.000	20	5.80	1.92	1.56	1	5.930	0.0012
		2480.0	1.000	20	5.80	1.92	1.56	1	5.930	0.0012
Bluetooth LE	---	2402.0	1.000	20	0.20	1.92	1.56	1	1.630	0.0003
		2440.0	1.000	20	0.20	1.92	1.56	1	1.630	0.0003
		2480.0	1.000	20	0.20	1.92	1.56	1	1.630	0.0003

Note:
1. The Numeric Gain calculated by $10^{\wedge}(ant. Gain(dBi)/10)$.
2. Each band max power which perform MPE of any configurations.
3. The MPE results are evaluated by lowest data rate for wlan.
4. The device operating 802.11b & 802.11g 802.11n mode is Diversity with transmit signals to 1TX.
5. In Bluetooth and Bluetooth-LE functions, these can be only chosen one of them for transmission.
6. In Bluetooth and WLAN functions, they can be chosen to simultaneously transmitted.

Simultaneous Transmitting:

Simultaneous MPE = Bluetooth MPE + IEEE 802.11 2.4GHz MPE = 0.0012 + 0.027 = 0.0282 mW/cm² < 10 mW/cm²