

Maximum Permission Exposure Calculation Report

On Behalf of

Shenzhen Raysgem Electronic Science and Technology Co., LTD
4/5F, Bldg 2, BaoNan Rd. Industrial Park, Nanyue Communities, LongGang,
Shenzhen, China

Product Name:	LOONA
Model/Type No.:	RC133N1, RC133N1S, RC133N2, RC133N2S
FCC ID Number:	FCC ID: 2AM99-RC133N
Prepared By:	Shenzhen Hongcai Testing Technology Co., Ltd. 1st-3rd Floor, Building C, Shuanghuan Xin Yi Dai Hi-Tech Industrial Park, No.8 Baoqing Road, Baolong Industrial Zone, Longgang District, Shenzhen, Guangdong, China Tel: +86-755-86337020 Fax: +86-755-86337028
Report Number:	HCT17GR186E-4
Tested Date:	June 20~July 07, 2017
Issued Date:	July 10, 2017
Tested By:	John Zeng/ 

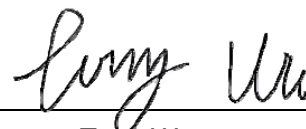
Reviewed By:



Owen.Yang

EMC Technical Supervisor

Approved By:



Tony Wu

EMC Technical Manager

TABLE OF CONTENTS

1 - GENERAL INFORMATION	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
1.2 OBJECTIVE	4
1.3 GENERAL DESCRIPTION OF TEST	4
1.4 HUMAN EXPOSURE ASSESSMENT RESULTS	5



1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Shenzhen Raysgem Electronic Science and Technology Co., LTD
Address of Applicant:	4/5F, Bldg 2, BaoNan Rd. Industrial Park, Nanyue Communities, LongGang, Shenzhen, China
Manufacturer:	Shenzhen Raysgem Electronic Science and Technology Co., LTD
Address of Manufacturer:	4/5F, Bldg 2, BaoNan Rd. Industrial Park, Nanyue Communities, LongGang, Shenzhen, China

General Description of E.U.T

Items	Description
EUT Description:	LOONA
Model No.:	RC133N1
Brand Name:	LOONA
Supplementary Model:	RC133N1S, RC133N2, RC133N2S
Operation Frequency:	For 802.11a/n HT20: 5150~5250MHz, 5725~5825MHz
Channel numbers:	802.11a/802.11n HT20: 9 Channels
Channel separation:	802.11a/802.11n HT20:20MHz
Modulation technology: (IEEE 802.11a)	BPSK,QPSK,16-QAM,64-QAM
Modulation technology: (IEEE 802.11n HT20)	BPSK,QPSK,16-QAM,64-QAM
Data speed (IEEE 802.11a):	6Mbps,9Mbps,12Mbps,18Mbps,24Mbps,36Mbps,48Mbps,54Mbps
Data speed (IEEE 802.11n HT20):	MCS0: 6.5Mbps,MCS1:13Mbps,MCS2:19.5Mbps,MCS3:26Mbps, MCS4:39Mbps,MCS5:52Mbps,MCS6:58.5Mbps,MCS7:65Mbps
Antenna Type:	Internal Antenna
Antenna Gain:	2dBi
Adapter Information:	Adapter : Input: AC 100V~240V, 50/60Hz, 1.2A Output: DC 12V, 3A

Remark: * The test data gathered are from the production sample provided by the manufacturer.

1.2 Objective

The objective of the following report is used to demonstrate that EUT operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the relative provisions of FCC 47CFR Part 1.1310 and Part 2.1091.

1.3 General Description of Test

Items	Description
EUT Frequency band	☒ FHSS: 2.400GHz ~ 2.483GHz ☒ WLAN: 2.400GHz ~ 2.483GHz ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☒ WLAN: 5.745GHz ~ 5825GHz ☐ Others: _____
Device category	☐ Portable (<20cm separation) ☐ Mobile (>20cm separation) ☒ Others <u>Fixed location</u> (>20cm separation)
Exposure classification	☐ Occupational/Controlled exposure ($S = 5\text{mW/cm}^2$) ☒ General Population/Uncontrolled exposure ($S=1\text{mW/cm}^2$) ☐ Others: _____
Antenna diversity	☒ Single antenna ☐ Multiple antennas: ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Max. output power	19.6dBm (0.0912W)
Antenna gain (Max)	2dBi (Numeric gain:1.58)
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation
Note: 1. The maximum output is 19.6dBm at IEEE 802.11b mode 2412MHz (with 1.58 numeric antenna gain.) 2. For mobile or fixed location transmitters, no SAR consideration applied. The minimum separation generally be used is at least 20 cm, even if the calculations indicate that the MPE distance would be lesser.	

1.4 Human Exposure Assessment Results

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 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
300–1,500			f/300	6
1,500–100,000			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
300–1,500			f/1500	30
1,500–100,000			1.0	30

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

Calculation

$$\text{Given } E = \frac{\sqrt{30 \times P \times G}}{d} \quad \& \quad S = \frac{E^2}{3770}$$

Where E = Field Strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = 100 * d \text{ (m)}$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$

Equation 1

Where d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW / cm²

EUT parameter (data from the separate report)	
Given $E = \frac{\sqrt{30 \times P \times G}}{d} \quad \& \quad S = \frac{E^2}{3770}$	Where G: numerical gain of transmitting antenna; TP: Transmitted power in watt; d: distance from the transmitting antenna in meter
The Bluetooth module and the WiFi module can not transmitting Simultaneously. And the max output power was in low channel of the 802.11b mode.	
Max output power in Watt (TP)	19.6dBm (0.0912W)
Antenna gain (G)	2dBi (Numeric gain:1.58)
Exposure classification	S=1mW/cm ²
Minimum distance in meter (d) (from transmitting structure to the human body)	20cm (0.2m)
Yields $S = \frac{30 \times P \times G}{3770 d^2}, \quad P=0.0912W, G=1.58, d=0.2$ $S=0.029mW/cm^2$	
Conclusion: S=0.029mW/cm ² is significant lower than the FCC 47CFR Part 1.1310 Limit 1mW/cm ² . (For mobile or fixed location transmitters, the maximum power density is 1.0 mW / cm ² even if the calculation indicates that the power density would be larger.)	