

RF Exposure Evaluation Declaration

Product Name : Cassia Hub
Model No. : C1000
FCC ID : 2AGF9C1000

Applicant : BEIJING CASSIA NETWORKS TECHNOLOGY
CO.,LTD
Address : Room 206,District B,2/F,No.12,Xinxi Road,Haidian
District,Beijing

Date of Receipt : Oct. 27, 2015
Issued Date : Jan. 13, 2016
Report No. : 15A0076R-RF-US-P20V01
Report Version : V1.0

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by any agency of the government.

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Test Report Certification

Issued Date : Jan. 13, 2016

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Address : Room 206,District B,2/F,No.12,Xinxi Road,Haidian
District,Beijing
Manufacturer : BEIJING CASSIA NETWORKS TECHNOLOGY CO.,LTD
Address : Room 206,District B,2/F,No.12,Xinxi Road,Haidian
District,Beijing
Model No. : C1000
FCC ID : 2AGF9C1000
IC : 20842-C1000
EUT Voltage :: DC 12V
Brand Name : Cassia
Applicable Standard : KDB 447498D01V06
FCC Part1.1310(b)
Test Result : Complied
Performed Location : Suzhou EMC Laboratory
No.99 Hongye Rd., Suzhou Industrial Park, Suzhou,
215006, Jiangsu, China
TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098
FCC Registration Number: 800392

Documented By : Elaine neng
Reviewed By : Jack Zhang
Approved By : Harry Zhou

Laboratory Information

We, **QuietTek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	:	BSMI, NCC, TAF
USA	:	FCC
Japan	:	VCCI
China	:	CNAS

The related certificate for our laboratories about the test site and management system can be downloaded from QuietTek Corporation's Web Site :<http://www.quietek.com/tw/ctg/cts/accreditations.htm>
The address and introduction of QuietTek Corporation's laboratories can be founded in our Web site :
<http://www.quietek.com/>

If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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TEL : +86-512-6251-5088 / FAX : 86-512-6251-5098 E-Mail : service@quietek.com

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
15A0076R-RF-US-P20V01	V1.0	Initial Issued Report	Jan. 13, 2016

1. RF Exposure Evaluation

1.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

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)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

Friis transmission 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

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

1.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 18°C and 78% RH.

1.3. Test Result of RF Exposure Evaluation

Product	:	Cassia Hub
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-6

- Antenna Gain:

Antenna List

Antenna	Type	Model No.	Peak Gain
Antenna	Omni antenna	SPQ-2400-2T	1.5dBi

Bluetooth Antenna List

Antenna	Manufacturer	Model No.	Peak Gain	Directional Gain
directional antenna 1	SUNPARL	SPDB-2400-9V120	7.96dBi for 2.4GHz	12.73dBi for 2.4GHz
directional antenna 2	SUNPARL	SPDB-2400-9V120	7.96dBi for 2.4GHz	
directional antenna 3	SUNPARL	SPDB-2400-9V120	7.96dBi for 2.4GHz	

Not: Directional gain = $G_{ANT} + 10 \log(N_{ANT})$ dBi

Note: 1: The EUT has three BT antennas, and each port has same gain, they transmit signals are correlated with each other.

(1) 2.4G BT Directional gain for CDD Calculation is:

- For power measurements
 $\text{Array Gain} = 0 \text{ dB (i.e., no array gain) for } N_{ANT} \leq 4;$
 $\text{Directional gain} = G_{ANT} + \text{Array Gain} = 7.96 \text{ dBi}$
- For power spectral density (PSD) measurements
 $\text{Directional gain} = G_{ANT} + \text{Array Gain} \approx 12.73 \text{ dBi}$

- Output Power into Antenna & RF Exposure Evaluation Distance:

Standalone modes

2400~2483.5MHz:

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)
802.11b	2412 - 2462	16.51	1.5	0.012581
802.11g	2412 - 2462	18.98	1.5	0.022219
802.11n(20MHz)	2412 - 2462	16.69	1.5	0.013114

2402- 2480MHz:

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)
Transmitter-1Mbps (GFSK_DH5)	2402- 2480	6.62	12.73	0.017129
Transmitter-2Mbps (Pi/4 DQPSK_DH5)	2402- 2480	4.04	12.73	0.009457
Transmitter-3Mbps (8DPSK_DH5)	2402- 2480	4.39	12.73	0.010250
BLE	2402- 2480	10.61	12.73	0.042927

Simultaneous transmission:

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (dBm)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)
802.11g	2412 - 2462	18.98	1.5	0.022219
BLE	2402- 2480	10.61	12.73	0.042927
Simultaneous transmission power density				0.065146

So according to transmission formula: $P_d = (P_{out} * G) / (4 * \pi * r^2)$ and the power density limit 1 mW/cm²

Safety Distance Calculation Formula:

The power flux:

$$S = \frac{P * G_{(\theta, \phi)}}{4 * \pi * r^2}$$

So safety distance as following:

$$r = \sqrt{\frac{P * G}{4 * \pi * S}}$$

P = input power of the antenna

G = antenna gain relative to an isotropic antenna

θ, ϕ = elevation and azimuth angles.

r = distance from the antenna to the point of investigation

Test Mode	Frequency Range (MHz)	Maximum EIRP (dBm)	Limit of Power Density S(mW/cm ²)	Safety Distance r(cm)
802.11g	2412 - 2462	20.48	1	5.10
BLE	2402- 2480	23.34	1	

Note: The safety distance is 5.10cm for the router without any other radio equipment.

_____ The End _____