

## 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, Xinxin 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.

The test report shall not be reproduced without the written approval of QuieTek Corporation.

# Test Report Certification

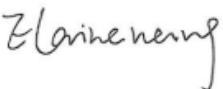
Issued Date : Jan. 13, 2016

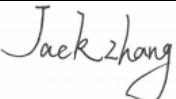
Report No. : 15A0076R-RF-US-P20V01



a  **DEKRA** company

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

Reviewed By : 

Approved By : 

## Laboratory Information

We, **QuieTek 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 QuieTek Corporation's Web Site :<http://www.quietek.com/tw/ctg/cts/accreditations.htm>  
The address and introduction of QuieTek 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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## 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 <sup>2</sup> )	Average Time (Minutes)
<b>(A) Limits for Occupational/ Control Exposures</b>				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
<b>(B) Limits for General Population/ Uncontrolled Exposures</b>				
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/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

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

$P_d$  is the limit of MPE, 1 mW/cm<sup>2</sup>. 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	
directional antenna 2	SUNPARL	SPDB-2400-9V120	7.96dBi for 2.4GHz	
directional antenna 3	SUNPARL	SPDB-2400-9V120	7.96dBi for 2.4GHz	12.73dBi 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

Array Gain = 0 dB (i.e., no array gain) for  $N_{ANT} \leq 4$ ;

Directional gain =  $G_{ANT} + \text{Array Gain} = 7.96\text{dBi}$

- For power spectral density (PSD) measurements

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/cm2)
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/cm2)
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 <sup>2</sup> )
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:  $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$  and the power density limit 1 mW/cm<sup>2</sup>

**Safety Distance Calculation Formula:**

The power flux:

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

So safety distance as following:

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

P = input power of the antenna

G = antenna gain relative to an isotropic antenna

$\theta, \phi$  = 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 <sup>2</sup> )	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