

RF Exposure Evaluation Declaration

Product Name : IP-STB
Model No. : 4400X
FCC ID : TC2-R1010
IC : 5959A-R1010

Applicant : Roku Inc.

Address : 12980 Saratoga Ave, Suite D Saratoga, CA 95070

Date of Receipt : Aug.31, 2015
Issued Date : Sept. 22, 2015
Report No. : 1590118R-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 TAF or any agency of the government.

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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
1590118R-RF-US-P20V01	V1.0	Initial Issued Report	Sept. 22, 2015

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	:	IP-STB
Test Item	:	RF Exposure Evaluation
Test Site	:	AC-6

- Antenna Gain:

No.	Peak Gain
WIFI ANT	2.4GHz band: 2.39dBi 5GHz Band: 3.6dBi
BT ANT	0.7dBi

1.3.1 Standalone transmission of RF Exposure Evaluation

- Output Power into Antenna & RF Exposure Evaluation Distance:

Test Mode	Frequency Band (MHz)	Maximum Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
802.11b/g/n(20MHz)	2412~2462MHz	411.150	0.142
802.11n(40MHz)	2422~2452MHz	232.274	0.080
802.11a/n(20MHz)/ac(20MHz)	5180~5240MHz 5745~5825MHz	55.081	0.025
802.11n(40MHz)/ac(40MHz)	5190~5230MHz 5755~5795MHz	49.317	0.022
802.11ac(80MHz)	5210MHz 5775 MHz	10.593	0.005
Bluetooth	2402~2480MHz	4.370	0.001

Note: The standalone power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is below the limit of 1 mW/cm².

1.3.2 Simultaneous transmission of RF Exposure Evaluation

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

- The $[\sum \text{ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg}] + [\sum \text{ of MPE ratios}]$ is ≤ 1.0 .
- The SAR to peak location separation ratios of all simultaneous transmitting antenna pairs operating in portable exposure conditions are all ≤ 0.04 and the $[\sum \text{ of MPE ratios}]$ is ≤ 1.0 .

Frequency Band (MHz)	WIFI Power Density at R = 20 cm (mW/cm ²)	BT Power Density at R = 20 cm (mW/cm ²)	\sum Power Density at R = 20 cm (mW/cm ²)
2412~2462MHz	0.142	0.001	0.143
2422~2452MHz	0.080	0.001	0.081
5180~5240MHz 5745~5825MHz	0.025	0.001	0.026
5190~5230MHz 5755~5795MHz	0.022	0.001	0.023
5210MHz 5775 MHz	0.005	0.001	0.006

Note: The simultaneous power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is below the limit of 1 mW/cm².

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