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RF Exposure Evaluation Report

Report No.:	CQASZ20200800871E-02
Applicant:	IoTree Limited
Address of Applicant:	Room B2, 4/F, Wah Shing Industrial Building, 18 Cheung Shun Street, Cheung Sha Wan, Hong Kong
Equipment Under Test (EUT):	
Product:	IoT Gateway
Model No.:	ICT-GW001
Brand Name:	IoTree
FCC ID:	2AW9Y-GW001
Standards:	47 CFR Part 1.1307 47 CFR Part 2.1093 KDB447498D01 General RF Exposure Guidance v06
Date of Receipt:	2020-08-18
Date of Test:	2018-08-18 to 2020-09-01
Date of Issue:	2020-09-01
Test Result:	**PASS***

***In the configuration tested, the EUT complied with the standards specified above**

Tested By: Martin Lee
(Martin Lee)

Reviewed By: Sheek Luo
(Sheek Luo)

Approved By:
(Jack Ai)

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20200800871E-02	Rev.01	Initial report	2020-09-01

2 Contents

3 General Information

3.1 Client Information

Applicant:	IoTree Limited
Address of Applicant:	Room B2, 4/F, Wah Shing Industrial Building, 18 Cheung Shun Street, Cheung Sha Wan, Hong Kong
Manufacturer:	Icreatec Limited
Address of Manufacturer:	Room 13, 25/F, ONE Midtown, 11 Hoi Shing Road, Tsuen Wan, N.T. Hong Kong
Factory:	Icreatec Limited
Address of Factory:	Room 13, 25/F, ONE Midtown, 11 Hoi Shing Road, Tsuen Wan, N.T. Hong Kong

3.2 General Description of EUT

Product Name:	IoT Gateway
Model No.:	ICT-GW001
Trade Mark:	IoTree
Hardware version:	ICT-GW-S-V1.0
Software version:	ICT-GW-H-V1.0
Operation Frequency:	2430MHz~2475MHz
Channel Numbers:	10
Channel Separation:	5MHz
Type of Modulation:	O-QPSK
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location
Test Software of EUT:	RF Test (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	2.0dBi
Power Supply:	DC 5V

4 SAR Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Limits

According to FCC Part1.1310: 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 part1.1307(b)

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 Exposures				
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
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	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
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: $Pd = (Pout*G)/(4* Pi * R^2)$

Where

Pd = power density in mW/cm2

Pout = 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

Pd id 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.

4.1.2 Test Procedure

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

4.1.3 EUT RF Exposure

1) For WIFI

Antenna Gain: 2.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.58 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

O-QPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2430MHz)	16.94	16.0±1	17.0	50.119
Middle(2450MHz)	15.86	15.0±1	16.0	39.811
Highest(2475MHz)	16.72	16.0±1	17.0	50.119

The worst case:

Maximum tune-up Power (mW)	**Antenna Gain (dBi)**	**Power Density at R = 20 cm (mW/cm^2)**	**Limit**	**Result**
50.119	2.0	0.0126	1.0	PASS

Note: 1) Refer to report No. CQASZ20200800871E-01 for EUT test Max Conducted peak Output Power value.

2) $Pd = (Pout*G)/(4* Pi * R^2)=(50.119*1.58)/(4*3.1416*20^2)=0.0126$