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RF Exposure Evaluation Report

Report No. : CQASZ20211202192E-02
Applicant: Qolsys, Inc.
Address of Applicant: 1900 The Alameda, 4th Floor, San Jose, CA 95126, USA
Equipment Under Test (EUT):
EUT Name: Portable electronic tablet computer
Model No.: IQ Hub
Test Model No.: IQ Hub
Brand Name: Qolsys, Inc.
FCC ID: 2AAJXQS-IQHUB
Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06
Date of Receipt: 2021-05-08
Date of Test: 2021-05-08 to 2021-06-16
Date of Issue: 2022-04-13
Test Result : **PASS***

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

Tested By:

Timo Lei

(Timo Lei)

Reviewed By:

Rock Huang

(Rock Huang)

Approved By:

Jack Ai

(Jack Ai)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20211202192E-02	Rev.01	Initial report	2022-04-13

Notes:

This product has not changed in the wireless part of the original case, and the product layout has been changed.

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3 General Information

3.1 Client Information

Applicant:	Qolsys, Inc.
Address of Applicant:	1900 The Alameda, 4th Floor, San Jose, CA 95126, USA
Manufacturer:	Chengdu Vantron Technology Co., Ltd.
Address of Manufacturer:	No.5 GaoPeng Road, Hi-Tech Zone, Chengdu, SiChuan, P.R. China 610045
Factory:	Chengdu Vantron Technology Co., Ltd.
Address of Factory:	No.5 GaoPeng Road, Hi-Tech Zone, Chengdu, SiChuan, P.R. China 610045

3.2 General Description of EUT

Product Name:	Portable electronic tablet computer
Model No.:	IQ Hub
Test Model No.:	IQ Hub
Trade Mark:	Qolsys, Inc.
Hardware Version:	Rev 5.1.1
Software Version:	1.0 FCC
Frequency Range:	PowerG:912.75~919.106MHz Z-Wave:908.4MHz ~ 916MHz Bluetooth: 2402MHz~2480MHz WiFi 802.11 b/g/n: 2412MHz to 2462MHz IEEE802.11ac: 5150MHz ~5250 MHz IEEE802.11ac(80M): 5725MHz ~5850MHz LTE:Band 2/4/5/12/13/25/26
Modulation Type:	PowerG: GFSK Z-Wave:GFSK Bluetooth: GFSK, $\pi/4$ DQPSK, 8DPSK WiFi 802.11 b/g/n: DSSS, OFDM IEEE802.11ac: OFDM IEEE802.11ac(80M): OFDM LTE: QPSK, 16QAM, 64QAM
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Power Supply:	Li-ion battery: DC 3.7V 2600mAh 9.62Wh, Charge by DC 12V for adapter
Adapter:	MODEL:SW-120100 INPUT:100-240V~50/60Hz 0.68A Max OUTPUT:12.0V = 1000mA

Note:

All model:IQ Hub, IQ Hub PowerG

Only test the IQ Hub model, because the circuit design, layout, components and internal wiring of the above models are the same, but the model name is different.

4 MPE Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Limits

1. 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: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

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.

2. According to KDB447498D01 General RF Exposure Guidance v06 4.3.1. Standalone SAR test exclusion considerations Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$\left[\frac{\text{max. power of channel, including tune-up tolerance, mW}}{\text{min. test separation distance, mm}} \right] \cdot \sqrt{f(\text{GHz})} \leq 3.0$$
 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

$f(\text{GHz})$ is the RF channel transmit frequency in GHz

Power and distance are rounded to the nearest mW and mm before calculation¹⁷

The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≥ 20 cm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

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

$$\text{eirp} = \text{pt} \times \text{gt} = (\text{E} \times \text{d})^2 / 30$$

where:

pt = transmitter output power in watts,

gt = numeric gain of the transmitting antenna (unitless),

E = electric field strength in V/m, $\text{---}10^{((\text{dB}\mu\text{V/m})/20)/10^6}$,

d = measurement distance in meters (m)---3m,

So $\text{pt} = (\text{E} \times \text{d})^2 / 30 / \text{gt}$

MPE evaluation for single transmission:

Mode	Frequency Range (MHz)	Ant gain		TUNE-UP Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)	(dBm)	(mw)			
WiFi	2412-2462	2.67	1.85	23.0	199.53	20	0.073	1.0
	5180-5240	1.02	1.26	13.0	19.95	20	0.005	1.0
	5745-5825	1.02	1.26	6.0	3.98	20	0.001	1.0
BLE	2402-2480	2.67	1.85	5.0	3.16	20	0.001	1.0
PowerG	912.755-919.106	2	1.58	13.45	22.13	20	0.007	0.61
Z-wave	908.4 5-916	0.50	1.12	-20	0.01	20	0.000	0.61
WCDMA BAND 5	824-849	1.6	1.45	24	251.9	20	0.072	0.55
WCAMA BAND 4	1710-1755	2.4	1.74	24	251.9	20	0.087	1.0
WCAMA BAND 2	1850-1910	2.4	1.74	24	251.9	20	0.087	1.0
LTE BAND 2	1850-1910	2.4	1.74	25	281.84	20	0.098	1.0
LTE BAND 4	1710-1755	2.4	1.74	25	281.84	20	0.098	1.0
LTE BAND 5	824-849	1.6	1.45	25	281.84	20	0.081	0.55
LTE BAND 12	699-716	1.6	1.45	25	281.84	20	0.081	0.47
LTE BAND 13	777-787	1.6	1.45	25	281.84	20	0.081	0.52
LTE BAND 25	1850-1915	2.4	1.74	25	281.84	20	0.098	1.0
LTE BAND 26	814-824	1.6	1.45	25	281.84	20	0.081	0.55

MPE evaluation for single transmission:

Note: Wi-Fi&BLE can't transmit simultaneously.

Wi-Fi (2.4G)&Wi-Fi (5G)can't transmit simultaneously.

Wi-Fi&PowerG&Z-wave&WCDMA/LTE or BLE&PowerG&Z-wave &WCDMA/LTE can transmit simultaneously, MPE evaluation is as below formula.

$PD1/Limit1+PD2/Limit2+.....<1$, PD (Power Density)

The worst case is as below:

MAX MPE of Wi-Fi(2.4G)&PowerG&Z-wave&MAX MPELTE

$=0.073/1.0+0.007/0.61+0.081/0.52=0.240<1.0$

Result: MPE evaluation of single and simultaneous transmission meet the requirement of standard.

END OF REPORT