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RF Exposure Evaluation Report

Report No. : CQASZ20181000013E-04

Applicant: Shenzhen Geniatech INC.,LTD.

Address of Applicant: 18th F, GDC Building, No 9th, Gaoxin Middle 3rd Rd. Nanshan District, Shenzhen, China

Manufacturer: Shenzhen Geniatech INC.,LTD.

Address of Manufacturer: 18th F, GDC Building, No 9th, Gaoxin Middle 3rd Rd. Nanshan District, Shenzhen, China

Equipment Under Test (EUT):

Product: Enjoy TV

Model No.: Please see page 5

Test Model No.: ATV495X

Brand Name: N/A

FCC ID: ZJU-E18DA5

Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06

Date of Test: 2018-10-15 to 2018-10-22

Date of Issue: 2018-10-29

Test Result : PASS*

Tested By:

Daisy Qin

(Daisy Qin)

Reviewed By:

Aaron Ma

(Aaron Ma)

Approved By:

Jack Ai

(Jack Ai)



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

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20181000013E-04	Rev.01	Initial report	2018-10-29

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3 General Information

3.1 Client Information

Applicant:	Shenzhen Geniatech INC.,LTD.
Address of Applicant:	18th F, GDC Building, No 9th, Gaoxin Middle 3rd Rd. Nanshan District, Shenzhen, China
Manufacturer:	Shenzhen Geniatech INC.,LTD.
Address of Manufacturer:	18th F, GDC Building, No 9th, Gaoxin Middle 3rd Rd. Nanshan District, Shenzhen, China

3.2 General Description of EUT

Product Name:	Enjoy TV
Model No.:	Please see page 5
Test Model No.:	ATV495X
Trade Mark:	N/A
Hardware Version:	V1.0
Software Version:	V1.0
Sample Type:	Internal antenna
Power Supply:	Adapter :INPUT:100-240~50/60Hz 2.0A OUTPUT:15V 4A

3.3 General Description of 2.4G WIFI

Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7 Channels
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20/40): OFDM (64QAM, 16QAM,QPSK,BPSK)
Test Software of EUT:	RF test (manufacturer declare)
Antenna Type:	Internal antenna
Antenna Gain:	2dBi

3.4 General Description of 5G WIFI

Operation Frequency:	5180 ~ 5240 MHz, 5745 ~ 5825 MHz
Channel Numbers:	5180 ~ 5240 MHz: 4 for 802.11a, 802.11ac (VHT20) 2 for 802.11ac (VHT40) 1 for 802.11ac (VHT80) 5745 ~ 5825 MHz: 5 for 802.11a, 802.11ac (VHT20) 2 for 802.11ac (VHT40) 1 for 802.11ac (VHT80)
Channel Separation:	IEEE 802.11a/n-HT20/ac-VHT20: 20 MHz IEEE 802.11n-HT40/ac-VHT40: 40 MHz

	IEEE 802.11ac-VHT80/: 80 MHz
Type of Modulation:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK)
Test Software of EUT:	RF test (manufacturer declare)
Antenna Type:	Internal antenna
Antenna Gain:	2dBi

3.5 General Description of BT

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.0
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Test Software of EUT:	Blue test (manufacturer declare)
Antenna Type:	Integral antenna
Antenna Gain:	2dBi

Note:

All model: ATV495X, APC390R, ATV390R, ATV495MAX, ATV598MAX, ATV599MAX, APC395X, ATV395X, APC1295, APC1967, ATV1660K, ATV135MAX, ATV195MAX, ATV168R, ATV195X, ATV315MAX, ATV315K, ATV329Q, ATV329A, ATV387, ATV315K, ATV1960, ATV1950A/T2/I, ATV1962A/T2/I, ATV1965A/T2/I/S2, ATV595X, ATV598E, ATV360, DB8, DB7, DB9, DB4Hub, TPC1010Q, TPC1560K, TPC1850T, TPC2150K, TPC3200K, TPC5500K, GTW350, GTW410, GTW389, GTW360, Flyfish, APC3399, DB4 IOT, ATV596X, ATV595X, ATV597E

Only the model ATV495X was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

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

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.

4.1.2 Test Procedure

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

4.2 1.1.3 EUT RF Exposure Evaluation

1) For BT

Antenna Gain: 2dBi

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

GFSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	4.380	4±1	5	3.162
Middle(2441MHz)	4.560	4±1	5	3.162
Highest(2480MHz)	3.820	4±1	5	3.162
π/4DQPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	0.560	0±1	1	1.259
Middle(2441MHz)	0.190	0±1	1	1.259
Highest(2480MHz)	-0.650	0±1	1	1.259
8DPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-0.340	-1±1	0	1.000
Middle(2441MHz)	-0.210	-1±1	0	1.000
Highest(2480MHz)	-2.060	-1.5±1	-0.5	0.891

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
3.162	2	0.000997	1.0	PASS

Note: 1) Refer to report No. CQASZ20181000013E-02 for EUT test Max Conducted Peak Output Power value.

$$2) P_d = (P_{out} * G) / (4 * \pi * R^2) = (3.162 * 1.58) / (4 * 3.1416 * 20^2) = 0.000997$$

2) For 2.4G WIFI

Antenna Gain: 2dBi

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

802.11b mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	11.13	11.5±0.5	12	15.849
Middle(2437MHz)	11.69	11.5±0.5	12	15.849
Highest(2462MHz)	11.91	11.5±0.5	12	15.849
802.11g mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	10.44	11±1.0	12	15.849
Middle(2437MHz)	11.1	11±1.0	12	15.849
Highest(2462MHz)	11.25	11±1.0	12	15.849
802.11n(HT20)mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	10.44	11±1.0	12	15.849
Middle(2437MHz)	11.1	11±1.0	12	15.849
Highest(2462MHz)	11.25	11±1.0	12	15.849
802.11n(HT40)mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2422MHz)	11.92	12±0.5	12.5	17.783
Middle(2437MHz)	12.24	12±0.5	12.5	17.783
Highest(2452MHz)	12.46	12±0.5	12.5	17.783

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
17.783	2	0.00561	1.0	PASS

Note: 1) Refer to report No. CQASZ170601302E-02 for EUT test Max Conducted average Output Power value.

$$2) P_d = (P_{out} * G) / (4 * \pi * R^2) = (17.783 * 1.58) / (4 * 3.1416 * 20^2) = 0.00561$$

3) For 5G WIFI

Antenna Gain: 2dBi

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

4.2.1.1 802.11a mode

Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
5180	10.94	11±1.0	12	15.849
5200	11.11	11±1.0	12	15.849
5240	11.89	11±1.0	12	15.849
5745	10.27	11±1.0	12	15.849
5785	10.23	11±1.0	12	15.849
5825	10.12	11±1.0	12	15.849
802.11n(HT20) mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
5180	11.01	10.5±1.5	12	15.849
5200	11.24	10.5±1.5	12	15.849
5240	11.95	10.5±1.5	12	15.849
5745	10.42	10.5±1.5	12	15.849
5785	9.3	10.5±1.5	12	15.849
5825	9.87	10.5±1.5	12	15.849
802.11n(HT40)mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)

5190	9.5	10±1.0	11	12.589
5230	10.88	10±1.0	11	12.589
5755	9.42	10±1.0	11	12.589
5795	9.54	10±1.0	11	12.589
5190	9.5	10±1.0	11	12.589
802.11ac(VHT20)mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
5180	10.42	11±1.0	12	15.849
5200	10.98	11±1.0	12	15.849
5240	11.78	11±1.0	12	15.849
5745	10.43	11±1.0	12	15.849
5785	10.31	11±1.0	12	15.849
5825	10.34	11±1.0	12	15.849
802.11ac(VHT40)mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
5190	10.49	10.5±1.0	11.5	14.125
5230	11.1	10.5±1.0	11.5	14.125
5755	10.3	10.5±1.0	11.5	14.125
5795	10.2	10.5±1.0	11.5	14.125
5190	10.49	10.5±1.0	11.5	14.125
802.11acV(HT80)mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
5210	11.09	10.5±1.0	11.5	14.125
5775	10.51	10.5±1.0	11.5	14.125

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
15.849	2	0.005	1.0	PASS

Note: 1) Refer to report No. CQASZ170601302E-03 for EUT test Max Conducted average Output Power value.

$$2) P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (15.849 \cdot 1.58) / (4 \cdot 3.1416 \cdot 20^2) = 0.005$$