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Report Template Version: V03
Report Template Revision Date: Mar.1st, 2017

RF Exposure Evaluation Report

Report No. : CQASZ20210600844E-03
Applicant: SHENZHEN TVT DIGITAL TECHNOLOGY CO.,LTD.
Address of Applicant: 23rd Floor Building B4 Block 9, Shenzhen Bay science and technology ecological garden, Nanshan District, Shenzhen, P.R. China
Equipment Under Test (EUT):
Product: Face Recognition Access Control Terminal
All Model No.: TD-E2123-IC/PE/TP/WF, TD-E2123-PE/TP/WF, TD-E2123-IC/ID/PE/TP/WF
Test Model No.: TD-E2123-IC/PE/TP/WF
Brand Name: TVT
FCC ID: 2ATOW-TD-E2123
Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06
Date of Test: 2021-06-08 to 2021-06-30
Date of Issue: 2021-06-30
Test Result : **PASS***

Tested By: Lewis Zhou

(Lewis Zhou)

Reviewed By: Jun Li

(Jun Li)

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
CQASZ20210600844E-03	Rev.01	Initial report	2021-06-30

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3 General Information

3.1 Client Information

Applicant:	SHENZHEN TVT DIGITAL TECHNOLOGY CO.,LTD.
Address of Applicant:	23rd Floor Building B4 Block 9, Shenzhen Bay science and technology ecological garden, Nanshan District, Shenzhen, P.R. China
Manufacturer:	SHENZHEN TVT DIGITAL TECHNOLOGY CO.,LTD.
Address of Manufacturer:	23rd Floor Building B4 Block 9, Shenzhen Bay science and technology ecological garden, Nanshan District, Shenzhen, P.R. China
Factory:	HUIZHOU TVT DIGITAL TECHNOLOGY CO., LTD.
Address of Factory:	TVT Industry Park, No.2 XingKe Rd.(E), Dongjiang Hi-Tech Industry Park, Zhongkai Hi-Tech District, Huizhou

3.2 General Description of 2.4G WIFI

Product Name:	Face Recognition Access Control Terminal
Model No.:	TD-E2123-IC/PE/TP/WF, TD-E2123-PE/TP/WF, TD-E2123-IC/ID/PE/TP/WF
Test Model No.:	TD-E2123-IC/PE/TP/WF
Trade Mark:	TVT
Hardware version:	1.4
Software version:	5.0.1.0(20707)
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 and HT40) : OFDM (64QAM, 16QAM, QPSK,BPSK)
Transfer Rate:	IEEE for 802.11b: 1Mbps/2Mbps/5.5Mbps/11Mbps IEEE for 802.11g : 6Mbps/9Mbps/12Mbps/18Mbps/24Mbps/36Mbps/48Mbps/54Mbps IEEE for 802.11n(HT20) : 6.5Mbps/13Mbps/19.5Mbps/26Mbps/39Mbps/52Mbps/58.5Mbps/65Mbps IEEE for 802.11n(HT40) : 13.5Mbps/27Mbps/40.5Mbps/54Mbps/81Mbps/108Mbps/121.5Mbps/135Mbps
Product Type:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Test Software of EUT:	RF test
Antenna Type:	internal antenna
Antenna Gain:	2dBi
Power Supply:	DC12V/1A

3.3 General Description of NFC

Operation Frequency:	13.56MHz
Modulation Type:	ASK
Product Type:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Antenna Type:	PCB antenna
Antenna Gain:	0dBi

4 RF Exposure Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Standard Requirement

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.

4.1.2 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.

4.2 EUT RF Exposure Evaluation

1)For 2.4G WIFI

Antenna Gain: 2 dBi

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	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
2412	Ant1	9.95	9±1.0	10	10.000
2437	Ant1	11.06	10.5±1.0	11.5	14.25
2462	Ant1	10.17	9.5±1.0	10.5	11.22
802.11g mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
2412	Ant1	4.42	3.5±1.0	4.5	2.818
2437	Ant1	5.47	4.5±1.0	5.5	3.548
2462	Ant1	4.55	4±1.0	5.5	3.162
802.11n(HT20)mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
2412	Ant1	4.37	3.5±1.0	4.5	2.818
2437	Ant1	5.41	4.5±1.0	5.5	3.548
2462	Ant1	4.53	4±1.0	5	3.162
802.11n(HT40)mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
2422	Ant1	5.16	4.5±1.0	5.5	3.548
2437	Ant1	5.3	4.5±1.0	5.5	3.548
2452	Ant1	5.01	4±1.0	5	3.162

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
14.25	2	0.0028	1.0	PASS

Note: 1) Refer to report No. CQASZ20210600844E-01 for EUT test Max Conducted average Output Power value.

2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (14.25 * 1.58) / (4 * 3.1416 * 20^2) = 0.0028$

2) For NFC

The worst case (refer to report CQASZ20210600844E-02) is below:

Frequency (MHz)	Level (dBuV/m)	Polarization
13.56	73.76	Peak

For 13.56MHz wireless:

Field strength = 73.76dB μ V/m @3m

Ant. gain 0dBi; so Ant numeric gain=1

So $P_t = \{ [10^{(73.76/20)} / 10^6 \times 3]^2 / 30 / 1 \} \times 1000 \text{mW} = 0.007 \text{mW}$

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
0.007	0	1.39*1E-6	4.89	PASS

Note: 1) Refer to report No. CQASZ20210600844E-02 for EUT test Max Conducted average Output Power value.

3) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (0.007 * 1) / (4 * 3.1416 * 20^2) = 1.39 * 1E-6$