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Report Template Version: V04
Report Template Revision Date: 2018-07-06

RF Exposure Evaluation Report

Report No. :	CQASZ20190900877E-03
Applicant:	Molu Technology Industrial Co., LTD
Address of Applicant:	10F.-1, No. 24, Jilin Rd., Zhongshan Dist., Taipei City, Taiwan
Equipment Under Test (EUT):	
Product:	streaming music player
All Model No.:	TB30, TB31, TB32
Test Model No.:	TB30
Brand Name:	NEXUM
FCC ID:	2AAEF-TB30
Standards:	47 CFR Part 1.1307
	47 CFR Part 1.1310
	KDB447498D01 General RF Exposure Guidance v06
Date of Receipt:	2019-09-05
Date of Test:	2019-09-05 to 2019-09-10
Date of Issue:	2019-09-10
Test Result :	**PASS***

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

Tested By: Tom chen.

(Tom chen)

Reviewed By: Sheek. Luo

(Sheek Luo)

Approved By:

(Jack Ai)

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
CQASZ20190900877E-03	Rev.01	Initial report	2019-09-10

2 Contents

3 General Information

3.1 Client Information

Applicant:	Molu Technology Industrial Co., LTD
Address of Applicant:	10F.-1, No. 24, Jilin Rd., Zhongshan Dist., Taipei City, Taiwan
Manufacturer:	Shenzhen GGMM Industrial Company Limited
Address of Manufacturer:	Building No5,Yongxin Street,Shiyan,Baoan District,Shenzhen

3.2 General Description of EUT

Product Name:	streaming music player
All Model No.:	TB30, TB31, TB32
Test Model No.:	TB30
Trade Mark:	NEXUM
Hardware Version:	V1.2
Software Version:	V6
Sample Type:	☐ Mobile ☐ Portable ☒ Fix Location
Power Supply:	Adapter Model: A18A-050100U-UB2 Input: 100~240V 50/60Hz Max0.2A Output: 5V 1A

3.3 General Description of BT

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V5.0
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Test Software of EUT:	Blue test3 (manufacturer declare)
Antenna Type:	internal antenna with ipex connector
Antenna Gain:	3.8dBi

3.4 General Description of 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 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
Test Software of EUT:	MT7628 QA 0.0.0.96 (manufacturer declare)
Antenna Type:	internal antenna with ipex connector
Antenna Gain:	3.8dBi

Note:

Model No.: TB30, TB31, TB32

Only the model TB30 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: $Pd = (Pout*G)/(4* Pi * R^2)$

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.

4.2 1.1.3 EUT RF Exposure Evaluation

1) For BT

Antenna Gain: 3.8dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.4 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)	-3.560	-4±1	-3	0.501
Middle(2441MHz)	-1.490	-2±1	-1	0.794
Highest(2480MHz)	-0.630	-1±1	0	1.000
π/4DQPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-2.660	-3±1	-2	0.631
Middle(2441MHz)	0.550	0±1	1	1.259
Highest(2480MHz)	1.560	1±1	2	1.585
8DPSK mode				
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2402MHz)	-2.320	-3±1	-2	0.631
Middle(2441MHz)	0.730	0±1	1	1.259
Highest(2480MHz)	1.700	1±1	2	1.585

The worst case:

Maximum tune-up Power (mW)	**Antenna Gain (dBi)**	**Power Density at R = 20 cm (mW/cm^2)**	**Limit**	**Result**
1.585	3.8	0.0008	1.0	PASS

Note: 1) Refer to report No. CQASZ20190900877E-01 for EUT test Max Conducted Peak Output Power value.

2) $Pd = (Pout*G)/(4* Pi * R^2)=(1.585*2.4)/(4*3.1416*20^2)=0.0008$

2) For WIFI

Antenna Gain: 3.8dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.4 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

IEEE for 802.11b mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	11.45	10.5±1	11.5	14.125
Middle(2437MHz)	11.86	11±1	12	15.849
Highest(2462MHz)	12.27	11.5±1	12.5	17.783
IEEE for 802.11g mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	10.98	10±1	11	12.589
Middle(2437MHz)	10.24	9.5±1	10.5	11.220
Highest(2462MHz)	10.48	9.5±1	10.5	11.220
IEEE for 802.11n(HT20) mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2412MHz)	10.08	9.5±1	10.5	11.220
Middle(2437MHz)	10.26	9.5±1	10.5	11.220
Highest(2462MHz)	10.82	10±1	11	12.589
IEEE for 802.11n(HT40) mode				
Test channel	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
			(dBm)	(mW)
Lowest(2422MHz)	10.08	9.5±1	10.5	11.220
Middle(2437MHz)	10.69	10±1	11	12.589
Highest(2452MHz)	10.29	9.5±1	10.5	11.220

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm^2)	Limit	Result
17.783	3.8	0.0085	1.0	PASS

Note: 1) Refer to report No. CQASZ20190900877E-02 for EUT test Max Conducted average Output Power value.

2) $Pd = (Pout*G)/(4* Pi * R^2)=(17.783*1.0)/(4*3.1416*20^2)=0.0085$

WIFI, BDR and EDR can not simultaneous transmitting at same time.