



Shenzhen Huaxia Testing Technology Co., Ltd

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

Telephone: +86-755-26648640

Fax: +86-755-26648637

Website: www.cqa-cert.com

Report Template Version: V04

Report Template Revision Date: 2018-07-06

RF Exposure Evaluation Report

Report No. : CQASZ20201200046EX-02
Applicant: Guangzhou Zoombuying Tech Co.,LTD
Address of Applicant: 101, 863 Bld, No. 1, Kesheng Rd, Private Sci-Tech Park, Baiyun District, Guangzhou
Equipment Under Test (EUT):
Product: 4K Wireless Video Transmission System
Model No.: Mark-1000(4k), Mark-xxx (4K), Mark-xxx pro+, Mark-xxx SDI, Mark-xxx S, Mark-xxx Tx
Test Model No.: Mark-1000(4k)
Brand Name: RollMaster
FCC ID: 2AYL5-MARK1000
Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06
Date of Receipt: Dec. 21, 2020
Date of Test: Dec. 21, 2020 to Jan. 21, 2021
Date of Issue: Jan. 21, 2021
Test Result : **PASS***

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

Tested By: Jun Li
(Jun Li)

Reviewed By: Ares Liu
(Ares Liu)

Approved By: Sheek Luo
(Sheek Luo)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20201200046EX-02	Rev.01	Initial report	Jan. 21, 2021

2 Contents

	Page
1 VERSION	2
2 CONTENTS	3
3 GENERAL INFORMATION	4
3.1 CLIENT INFORMATION	4
3.2 GENERAL DESCRIPTION OF EUT	4
4 RF EXPOSURE EVALUATION.....	5
4.1 RF EXPOSURE COMPLIANCE REQUIREMENT.....	5
4.1.1 Limits	5
4.1.2 Test Procedure.....	5
4.1.3 EUT RF Exposure Evaluation standalone operations.....	6

3 General Information

3.1 Client Information

Applicant:	Guangzhou Zoombuying Tech Co.,LTD
Address of Applicant:	101, 863 Bld, No. 1, Kesheng Rd,Private Sci-Tech Park ,Baiyun District, Guangzhou
Manufacturer:	Guangzhou Zoombuying Tech Co.,LTD
Address of Manufacturer:	101, 863 Bld, No. 1, Kesheng Rd,Private Sci-Tech Park ,Baiyun District, Guangzhou

3.2 General Description of EUT

Product Name:	4K Wireless Video Transmission System
Model No.:	Mark-1000(4k), Mark-xxx (4K), Mark-xxx pro+, Mark-xxx SDI, Mark-xxx S, Mark-xxx Tx
Test Model No.:	Mark-1000(4k)
Trade Mark:	RollMaster
Hardware Version:	V1.0
Software Version:	V1.0
Sample Type:	☒ Mobile ☐ Portable ☐ Fix Location
Power Supply:	DC7-16V or DC7.4V-lithium battery
Operation Frequency:	5180 ~ 5240 MHz
Channel Numbers:	5180 ~ 5240 MHz: 4 Channels for 802.11a, 802.11n, 802.11ac 2 Channels for 802.11n40 , 802.11ac 40
Type of Modulation:	IEEE 802.11a/IEEE 802.11n/IEEE 802.11ac: OFDM
Antenna Type:	Glue stick antenna
Antenna Gain:	Antenna 1: 3dBi
	Antenna 2: 3dBi
	MIMO: 6.01dBi

Note:

Model No.: Mark-1000(4k), Mark-xxx (4K), Mark-xxx pro+, Mark-xxx SDI, Mark-xxx S, Mark-xxx Tx

Only the model Mark-1000(4k) 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.

4.1.3 EUT RF Exposure Evaluation standalone operations

2) For 5G WIFI

Antenna Gain: Antenna 1: 3dBi, Antenna 2: 3dBi, MIMO: 6.01dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.0 and 3.99 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Measurement Data

802.11a mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5180	Ant1	5.57	5±1.0	6.0	3.981
5180	Ant2	5.95	5±1.0	6.0	3.981
5200	Ant1	5.51	5±1.0	6.0	3.981
5200	Ant2	6.03	5±1.0	6.0	3.981
5240	Ant1	5.61	5±1.0	6.0	3.981
5240	Ant2	5.87	5±1.0	6.0	3.981
802.11n(HT20) SISO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5180	Ant1	5.61	5±1.0	6.0	3.981
5180	Ant2	6.12	5±1.0	6.0	3.981
5200	Ant1	5.90	5±1.0	6.0	3.981
5200	Ant2	6.12	5±1.0	6.0	3.981
5240	Ant1	5.80	5±1.0	6.0	3.981
5240	Ant2	5.67	5±1.0	6.0	3.981
802.11n(HT40) SISO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5190	Ant1	4.68	4±1.0	5.0	3.162
5190	Ant2	5.14	4±1.0	5.0	3.162
5230	Ant1	4.65	4±1.0	5.0	3.162
5230	Ant2	4.75	4±1.0	5.0	3.162

802.11ac(VHT20) SISO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5180	Ant1	5.92	5±1.0	6.0	3.981
5180	Ant2	5.36	5±1.0	6.0	3.981
5200	Ant1	5.90	5±1.0	6.0	3.981
5200	Ant2	5.30	5±1.0	6.0	3.981
5240	Ant1	5.81	5±1.0	6.0	3.981
5240	Ant2	4.76	4±1.0	5.0	3.162
802.11ac(VHT40) SISO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5190	Ant1	4.71	4±1.0	5.0	3.162
5190	Ant2	5.06	4±1.0	5.0	3.162
5230	Ant1	4.14	4±1.0	5.0	3.162
5230	Ant2	4.72	4±1.0	5.0	3.162

802.11a MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5180	Ant1+2	8.77	8±1.0	9.0	7.943
5200	Ant1+2	8.79	8±1.0	9.0	7.943
5240	Ant1+2	8.75	8±1.0	9.0	7.943
802.11n(HT20) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5180	Ant1+2	8.88	8±1.0	9.0	7.943
5200	Ant1+2	9.02	8±1.0	9.0	7.943
5240	Ant1+2	8.75	8±1.0	9.0	7.943
802.11n(HT40) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5190	Ant1+2	7.93	7±1.0	8.0	6.310
5230	Ant1+2	7.71	7±1.0	8.0	6.310
802.11ac(VHT20) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5180	Ant1+2	8.66	8±1.0	9.0	7.943
5200	Ant1+2	8.62	8±1.0	9.0	7.943
5240	Ant1+2	8.33	8±1.0	9.0	7.943
802.11ac(VHT40) MIMO mode					
Test channel	Antenna	Average Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power	
				(dBm)	(mW)
5190	Ant1+2	7.90	7±1.0	8.0	6.310
5230	Ant1+2	7.45	7±1.0	8.0	6.310

The worst case:

Maximum tune-up Power (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
7.943	3	0.00316	1.0	PASS

Note: 1) Refer to report No. CQASZ20201200046EX-01 for EUT test Max Conducted average Output Power value.

2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (7.943 \cdot 2.0) / (4 \cdot 3.1416 \cdot 20^2) = 0.00316$