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RF MPE REPORT

Application No.:	SHCR2112000925AT
FCC ID:	UCZ-B862AJ-Z
IC :	8575A-B862AJZ
Applicant:	Lorex Technology Inc.
Address of Applicant:	250 Royal crest Court Markham, L3R 3S1 Ontario, Canada.
Manufacturer:	Lorex Technology Inc.
Address of Manufacturer:	250 Royal crest Court Markham, L3R 3S1 Ontario, Canada.

Equipment Under Test (EUT):

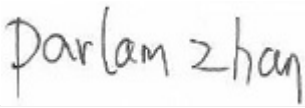
EUT Name:	4K Video Doorbell
Model No.:	B862AJ-Z
Standard(s) :	FCC Rules 47 CFR §2.1091 KDB447498 D01 General RF Exposure Guidance v06 RSS-102 Issue 5 Amendment 1 (February 2, 2021)
Date of Receipt:	2021-12-06
Date of Test:	2021-12-06 to 2021-12-23
Date of Issue:	2021-12-24
Test Result:	**Pass***

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

Parlam Zhan

Parlam Zhan
E&E Section Manager

Revision Record			
Version	**Description**	**Date**	**Remark**
00	Original	2021-12-24	/

Authorized for issue by:				
				
		Micheal Niu / Project Engineer		
				
		Parlam Zhan / Reviewer		

2 Contents

3 General Information

3.1 General Description of E.U.T.

Power supply:	DC 3.7V by rechargeable lithium battery charged by 16-24 VAC or DC 5V 2A by USB port Battery Model: 1S1P 652023P Rated Voltage: 3.7V Capacity: 0.2Ah Energy: 0.74Wh Charging Voltage: 4.2V
Serial Number:	ND012103120937
Firmware Version:	V1.0

3.2 Technical Specifications

2.4GHz

Antenna Gain:	Ant 1:1.68dBi (Provided by manufacturer) Ant 2:3.42dBi (Provided by manufacturer) Directional Gain: 5.60dBi
Antenna Type:	Antenna 1: FPC Antenna Antenna 2: FPC Antenna
Channel Spacing:	5MHz
Data Rate:	802.11b: 1/2/5.5/11Mbps, 802.11g: 6/9/12/18/24/36/48/54Mbps 802.11n: MCS 0 to 7 for HT20MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20):11
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz

For FCC 5G

	Band	Mode	Frequency Range(MHz)	Number of channels
Operation Frequency:	UNII Band I	802.11a/n(HT20)/ac(VHT20)	5180-5240	4
		802.11n(HT40)/ac(VHT40)	5190-5230	2
		802.11ac(VHT80)	5210	1
	UNII Band II-A	802.11a/n(HT20)/ac(VHT20)	5260-5320	4
		802.11n(HT40)/ac(VHT40)	5270-5310	2
		802.11ac(VHT80)	5290	1
	UNII Band II-C	802.11a/n(HT20)/ac(VHT20)	5500-5700	11
		802.11n(HT40)/ac(VHT40)	5510-5670	5
		802.11ac(VHT80)	5530~5610	2
	UNII Band III	802.11a/n(HT20)/ac(VHT20)	5745-5825	5
		802.11n(HT40)/ac(VHT40)	5755-5795	2
		802.11ac(VHT80)	5775	1
Modulation Type:	802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)			
Channel Spacing:	802.11a/n(HT20)/ac(VHT20): 20MHz			

	802.11n(HT40)/ac(VHT40): 40MHz 802.11ac(VHT80): 80MHz
Data Rate:	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: MCS0-15 802.11ac: MCS0-9
Antenna Gain:	Antenna 1:2.99dBi; (Provided by manufacturer) Antenna 2:2.83dBi; (Provided by manufacturer) Directional Gain:5.92dBi
Antenna Type:	Antenna 1: FPC Antenna; Antenna 2: FPC Antenna

For IC 5G

Operation Frequency:	Band	Mode	Frequency Range(MHz)	Number of channels
	UNII Band II-A	802.11a/n(HT20)/ac(VHT20)	5260-5320	4
		802.11n(HT40)/ac(VHT40)	5270-5310	2
		802.11ac(VHT80)	5290	1
	UNII Band II-C	802.11a/n(HT20)/ac(VHT20)	5500-5700	8
		802.11n(HT40)/ac(VHT40)	5510-5670	3
		802.11ac(VHT80)	5530~5610	1
	UNII Band III	802.11a/n(HT20)/ac(VHT20)	5745-5825	5
		802.11n(HT40)/ac(VHT40)	5755-5795	2
		802.11ac(VHT80)	5775	1
Note:	5600MHz to 5650MHz band can not be operated in Canada			
Modulation Type:	802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)			
Channel Spacing:	802.11a/n(HT20)/ac(VHT20): 20MHz 802.11n(HT40)/ac(VHT40): 40MHz 802.11ac(VHT80): 80MHz			
Data Rate:	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: MCS0-15 802.11ac: MCS0-9			
Antenna Gain:	Antenna 1:2.99dBi; (Provided by manufacturer) Antenna 2:2.83dBi; (Provided by manufacturer) Directional Gain:5.92dBi			
Antenna Type:	Antenna 1: FPC Antenna; Antenna 2: FPC Antenna			

3.3 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

3.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L4354)

CNAS has accredited Compliance Certification Services (Kunshan) Inc. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 2541.01)

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

• FCC (Designation Number: CN1172)

Compliance Certification Services Inc. has been recognized as an accredited testing laboratory. Designation Number: CN1172.

• ISED (CAB identifier: CN0072)

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory.

Company Number: 2324E

• VCCI (Member No.: 1938)

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600,C-11707, T-11499, G-10216 respectively.

4 Test Standards and Limits

4.1 FCC Radiofrequency radiation exposure limits:

According to§1.1310, the limit for general population/uncontrolled exposures

Frequency	Power density(mW/cm^2)	Averaging time(minutes)
300MHz~1.5GHz	f/1500	30
1.5GHz~100GHz	1.0	30

4.2 IC Radiofrequency radiation exposure limits:

According to RSS-102 section 2.5.2, RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

• at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;

• at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);

• at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2}\ f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

• at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

For 2.4G device, the limit of worse case is 2.68 W

For 5G device,the limit of worse case is 4.53W

5 Measurement and Calculation

5.1 Maximum transmit power

The Power Data is based on the RF Test Report SHCR211200092501-2.4GHz

Test Mode	Channel	Antenna 1 Power[dBm]	Antenna 2 Power[dBm]	MIMO Power[dBm]	Antenna 1 Power[mW]	Antenna 2 Power[mW]	MIMO Power[mW]
11B	2412	15.91	16.26	/	**38.99**	**42.27**	/
	2437	15.33	16.10	/	34.12	40.74	/
	2462	15.34	16.06	/	34.20	40.36	/
11G	2412	11.75	11.70	/	14.96	14.79	/
	2437	11.11	11.56	/	12.91	14.32	/
	2462	10.95	11.24	/	12.45	13.30	/
11N20MIMO	2412	13.02	10.72	15.03	20.04	11.80	**31.84**
	2437	11.62	9.91	13.86	14.52	9.79	24.32
	2462	10.42	9.47	12.98	11.02	8.85	19.86

The Power Data is based on the RF Test Report SHCR211200092502-5GHz

Test Mode	Test Channel	Antenna 1 Power[dBm]	Antenna 2 Power[dBm]	MIMO Power[dBm]	Antenna 1 Power[mW]	Antenna 2 Power[mW]	MIMO Power[mW]
11A	5180	16.24	15.96	/	42.07	39.45	/
	5200	14.37	14.35	/	27.35	27.23	/
	5240	14.78	14.45	/	30.06	27.86	/
	5260	16.95	16.68	/	**49.55**	**46.56**	/
	5300	13.67	13.65	/	23.28	23.17	/
	5320	14.54	14.02	/	28.44	25.23	/
	5500	15.61	15.20	/	36.39	33.11	/
	5580	15.21	15.45	/	33.19	35.08	/
	5700	15.25	14.46	/	33.50	27.93	/
	5745	14.88	14.16	/	30.76	26.06	/
	5785	14.11	12.86	/	25.76	19.32	/
	5825	13.96	12.15	/	24.89	16.41	/
11N20	5180	11.09	11.06	14.09	12.85	12.76	25.64
	5200	13.37	12.91	16.16	21.73	19.54	41.30
	5240	13.12	12.70	15.93	20.51	18.62	39.17
	5260	11.95	11.98	14.98	15.67	15.78	31.48
	5300	11.77	11.57	14.68	15.03	14.35	29.38
	5320	11.20	11.44	14.33	13.18	13.93	27.10
	5500	12.90	12.56	15.74	19.50	18.03	37.50
	5580	13.82	13.44	16.64	24.10	22.08	**46.13**
	5700	13.11	13.17	16.15	20.46	20.75	41.21
	5745	12.78	11.36	15.14	18.97	13.68	32.66
	5785	12.09	11.04	14.61	16.18	12.71	28.91
	5825	11.20	10.46	13.86	13.18	11.12	24.32
11N40	5190	12.92	12.02	15.50	19.59	15.92	35.48
	5230	12.31	11.79	15.07	17.02	15.10	32.14
	5270	11.95	11.52	14.75	15.67	14.19	29.85
	5310	11.51	11.21	14.37	14.16	13.21	27.35
	5510	12.76	12.66	15.72	18.88	18.45	37.33
	5550	12.79	12.66	15.74	19.01	18.45	37.50
	5670	13.76	13.48	16.63	23.77	22.28	46.03
	5755	12.78	12.03	15.43	18.97	15.96	34.91
	5795	11.93	11.17	14.58	15.60	13.09	28.71
11AC20	5180	12.09	12.12	15.12	16.18	16.29	32.51
	5200	11.87	11.81	14.85	15.38	15.17	30.55
	5240	12.31	12.11	15.22	17.02	16.26	33.27
	5260	12.44	12.55	15.51	17.54	17.99	35.56
	5300	12.42	12.29	15.37	17.46	16.94	34.43
	5320	10.56	10.65	13.62	11.38	11.61	23.01
	5500	12.80	12.56	15.69	19.05	18.03	37.07
	5580	13.03	12.96	16.01	20.09	19.77	39.90
	5700	13.25	12.77	16.03	21.13	18.92	40.09
	5745	12.32	11.40	14.89	17.06	13.80	30.83
	5785	11.76	10.65	14.25	15.00	11.61	26.61
	5825	10.74	9.66	13.24	11.86	9.25	21.09
11AC40	5190	13.50	12.75	16.15	22.39	18.84	41.21
	5230	13.51	12.99	16.27	22.44	19.91	42.36

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	5270	13.10	12.86	15.99	20.42	19.32	39.72
	5310	12.98	12.69	15.85	19.86	18.58	38.46
	5510	12.67	12.64	15.67	18.49	18.37	36.90
	5550	12.86	12.84	15.86	19.32	19.23	38.55
	5670	12.50	12.72	15.62	17.78	18.71	36.48
	5755	12.90	11.96	15.47	19.50	15.70	35.24
	5795	12.97	11.76	15.42	19.82	15.00	34.83
11AC80	5210	12.97	12.28	15.65	19.82	16.90	36.73
	5290	11.85	12.20	15.04	15.31	16.60	31.92
	5530	13.29	12.60	15.97	21.33	18.20	39.54
	5610	12.76	12.80	15.79	18.88	19.05	37.93
	5775	13.10	11.64	15.44	20.42	14.59	34.99

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5.2 MPE Calculation

According to the formula $S=P/4\pi R^2$, we can calculate S which is MPE.

Note:

1) P (mW)
2) R = distance to the center of radiation of antenna (in meter) = 20cm
3) MPE limit = 1mW/cm²

For FCC:

For 2.4G WiFi –Antenna1:

The max. antenna gain is		1.68	dBi		
Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
38.99	1.472	20	0.01142	1	Pass

For 2.4G WiFi –Antenna2:

The max. antenna gain is		3.42	dBi		
Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
42.2	2.198	20	0.01845	1	Pass

In MIMO mode:

Two antennas can transmit simultaneously and they are correlated.

The max. antenna gain is		5.6	dBi		
Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
31.84	3.631	20	0.02300	1	Pass

For 5G WiFi –Antenna1:

The max. antenna gain is		2.99	dBi		
Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
49.55	1.991	20	0.01962	1	Pass

For 5G WiFi –Antenna2:

The max. antenna gain is		2.83	dBi		
Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
46.56	1.919	20	0.01777	1	Pass

In MIMO mode:

Two antennas can transmit simultaneously and they are correlated.

The max. antenna gain is		5.92	dBi		
Max. Conducted Power P(mW)	Gain in Linear Scale G	Operation Distance R(cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
46.13	3.908	20	0.03587	1	Pass

2.4G WiFi and 5G WiFi can simultaneous transmitting, so the maximum rate of MPE is 0.02300/1.0+0.03587/1.0=0.059<=1.0. according to the KDB447498 section 7.2 determine the device is exclusion from SAR test

For IC:

For 2.4GHz WiFi SISO mode:

Antenna 1:E.I.R.P.= P*G= 0.03899×1.472=0.057W<2.68W

Antenna 2:E.I.R.P.= P*G= 0.04220×2.198=0.093W<2.68W

For 2.4GHz WiFi MIMO mode: E.I.R.P.= P*G= 0.03184×3.631=0.116W<2.68W

For 5GHz WiFi SISO mode:

Antenna 1:E.I.R.P.= P*G= 0.04955×1.991=0.099W<4.53W

Antenna 2:E.I.R.P.= P*G= 0.04656×1.919=0.089W<4.53W

For 5GHz WiFi MIMO mode: E.I.R.P.= P*G= 0.04613×3.908=0.180W<4.53W

2.4G WiFi and 5G WiFi can simultaneous transmitting, so the maximum rate of MPE is 0.116/2.68+0.180/4.53=0.083<=1

So the device is exclusion from SAR test

--End of the Report--

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