

1 Cover Page

RF MPE REPORT

Application No.: SHCR2201000089AT
FCC ID: UCZ-B451AJ-Z1
IC: 8575A-B451AJZ1
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: 2K QHD Video Doorbell
Model No.: B451AJ-Z
HVIN: B451AJ-Z1
Trade mark: **LOREX**
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: 2021-12-21
Date of Test: 2022-01-04 to 2022-01-27
Date of Issue: 2022-02-10

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Parlan Zhan

Parlan Zhan
E&E Section Manager



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Revision Record			
Version	Description	Date	Remark
00	Original	2022-02-10	/

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



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2 Contents

	Page
1 COVER PAGE	1
2 CONTENTS	3
3 GENERAL INFORMATION	4
3.1 GENERAL DESCRIPTION OF E.U.T.	4
3.2 TECHNICAL SPECIFICATIONS	4
3.3 TEST LOCATION	6
3.4 TEST FACILITY.....	6
4 TEST STANDARDS AND LIMITS	7
4.1 FCC RADIOFREQUENCY RADIATION EXPOSURE LIMITS:.....	7
4.2 IC RADIOFREQUENCY RADIATION EXPOSURE LIMITS:.....	7
5 MEASUREMENT AND CALCULATION	8
5.1 MAXIMUM TRANSMIT POWER	8
5.2 MPE CALCULATION	11



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3 General Information

3.1 General Description of E.U.T.

Power supply:	AC 16V-24V 50/60Hz, 0.7A DC 3.7V Rechargeable Lithium ion Battery Battery Model: 1S1P 652023P Rate Voltage: 3.7V Charging Limit Voltage: 4.2V Rated Capacity: 0.2Ah/0.74Wh
Serial Number:	2M0024EPAG03422
Software Version:	V2.8

3.2 Technical Specifications

2.4G

Antenna Gain:	Ant 1: 1.58dBi (Provided by the manufacturer) Ant 2: 3.42dBi (Provided by the manufacturer) Directional Gain:5.56dBi
Antenna Type:	FPC Antenna
Channel Spacing:	5MHz
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



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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

Note: For frequencies falling between 5150-5250MHz and 5600-5650MHz will not be used 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:	Ant 1: 2.99dBi (Provided by the manufacturer) Ant 2: 2.83dBi (Provided by the manufacturer) Directional Gain:5.92dBi
Antenna Type:	Antenna 1: FPC Antenna; Antenna 2: FPC Antenna



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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.



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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



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5 Measurement and Calculation

5.1 Maximum transmit power

The Power Data is based on the RF Test Report SHCR220100008901-2.4GHz

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	14.65	13.78	NA	29.17	23.88	N/A
11B	2437	14.92	14.03	NA	31.05	25.29	N/A
11B	2462	14.69	13.79	NA	29.44	23.93	N/A
11G	2412	14.70	13.79	NA	29.51	23.93	N/A
11G	2437	14.78	13.63	NA	30.06	23.07	N/A
11G	2462	14.42	13.43	NA	27.67	22.03	N/A
HT20	2412	11.56	11.32	14.45	14.32	13.55	27.86
HT20	2434	11.87	11.23	14.57	15.38	13.27	28.64
HT20	2462	11.30	11.13	14.23	13.49	12.97	26.49



5GHz for FCC:

The Power Data is based on the RF Test Report SHCR220100008902-5GHz

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	14.38	14.14	/	27.42	25.94	/
	5200	13.76	13.81	/	23.77	24.04	/
	5240	13.50	13.42	/	22.39	21.98	/
	5260	14.74	14.82	/	29.79	30.34	/
	5300	14.32	14.27	/	27.04	26.73	/
	5320	14.30	14.32	/	26.92	27.04	/
	5500	14.50	14.50	/	28.18	28.18	/
	5580	14.44	14.48	/	27.80	28.05	/
	5700	14.62	14.58	/	28.97	28.71	/
	5745	14.48	14.47	/	28.05	27.99	/
	5785	14.25	14.28	/	26.61	26.79	/
5825	14.69	14.70	/	29.44	29.51	/	
11N20	5180	11.25	11.23	14.25	13.34	13.27	26.61
	5200	11.43	11.66	14.56	13.90	14.66	28.58
	5240	11.89	12.02	14.97	15.45	15.92	31.41
	5260	11.03	11.00	14.03	12.68	12.59	25.29
	5300	10.85	10.76	13.82	12.16	11.91	24.10
	5320	11.19	11.07	14.14	13.15	12.79	25.94
	5500	11.58	11.63	14.62	14.39	14.55	28.97
	5580	10.51	10.58	13.56	11.25	11.43	22.70
	5700	10.26	10.18	13.23	10.62	10.42	21.04
	5745	11.10	11.19	14.16	12.88	13.15	26.06
	5785	10.86	10.47	13.68	12.19	11.14	23.33
5825	11.43	11.35	14.40	13.90	13.65	27.54	
11N40	5190	11.29	11.38	14.35	13.46	13.74	27.23
	5230	10.88	10.89	13.90	12.25	12.27	24.55
	5270	11.36	11.37	14.38	13.68	13.71	27.42
	5310	11.34	11.40	14.38	13.61	13.80	27.42
	5510	11.11	11.13	14.13	12.91	12.97	25.88
	5550	10.79	10.77	13.79	11.99	11.94	23.93
	5670	12.03	11.10	14.60	15.96	12.88	28.84
	5755	11.68	11.64	14.67	14.72	14.59	29.31
5795	12.19	11.28	14.77	16.56	13.43	29.99	
11AC20	5180	11.31	11.66	14.50	13.52	14.66	28.18
	5200	11.73	11.33	14.54	14.89	13.58	28.44
	5240	10.86	10.50	13.69	12.19	11.22	23.39
	5260	11.71	11.49	14.61	14.83	14.09	28.91
	5300	11.21	10.47	13.87	13.21	11.14	24.38
	5320	10.42	10.75	13.60	11.02	11.89	22.91
	5500	11.41	11.86	14.65	13.84	15.35	29.17
	5580	11.57	11.56	14.58	14.35	14.32	28.71
	5700	12.23	12.00	15.13	16.71	15.85	32.58
	5745	11.50	11.35	14.44	14.13	13.65	27.80
	5785	11.77	11.48	14.64	15.03	14.06	29.11
5825	11.80	11.74	14.78	15.14	14.93	30.06	



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11AC40	5190	11.16	11.74	14.47	13.06	14.93	27.99
	5230	10.86	10.94	13.91	12.19	12.42	24.60
	5270	11.22	11.57	14.41	13.24	14.35	27.61
	5310	11.49	11.34	14.43	14.09	13.61	27.73
	5510	11.21	11.27	14.25	13.21	13.40	26.61
	5550	10.99	11.06	14.04	12.56	12.76	25.35
	5670	12.19	12.36	15.29	16.56	17.22	33.81
	5755	11.34	11.50	14.43	13.61	14.13	27.73
	5795	12.75	11.94	15.37	18.84	15.63	34.43
11AC80	5210	11.76	11.42	14.60	15.00	13.87	28.84
	5290	11.15	11.10	14.14	13.03	12.88	25.94
	5530	11.21	11.45	14.34	13.21	13.96	27.16
	5610	11.75	11.73	14.75	14.96	14.89	29.85
	5775	11.80	11.90	14.86	15.14	15.49	30.62



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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		1.58	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
31.65	1.439	20	0.00906	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
25.29	2.198	20	0.01106	1	Pass

In MIMO mode:

Two antennas can transmit simultaneously and they are correlated.

The max. antenna gain is		5.56	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
28.64	3.597	20	0.02050	1	Pass



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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
29.79	1.991	20	0.01180	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
30.34	1.919	20	0.01158	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
34.43	3.908	20	0.02677	1	Pass

The 2.4GHz WiFi and 5GHz WiFi can transmit simultaneously, but the maximum rate of MPE is $0.02050/1+0.02677/1=0.04727 \leq 1$. 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: $E.I.R.P. = P * G = 0.03105 \times 1.439 = 0.045W < 2.68W$

Antenna 2: $E.I.R.P. = P * G = 0.02529 \times 2.198 = 0.056W < 2.68W$

For 2.4GHz WiFi MIMO mode: $E.I.R.P. = P * G = 0.02864 \times 3.597 = 0.103W < 2.68W$

For 5GHz WiFi SISO mode:

Antenna 1: $E.I.R.P. = P * G = 0.02979 \times 1.991 = 0.059W < 4.53W$

Antenna 2: $E.I.R.P. = P * G = 0.03034 \times 1.919 = 0.058W < 4.53W$

For 5GHz WiFi MIMO mode: $E.I.R.P. = P * G = 0.03443 \times 3.908 = 0.135W < 4.53W$

The 2.4GHz WiFi and 5GHz WiFi can transmit simultaneously, but the maximum rate of MPE is $0.103/2.68+0.135/4.53=0.0682 \leq 1$. So the device is exclusion from SAR test.

--End of the Report--



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