



1 Cover Page

RF MPE REPORT

Application No.: SHEM2006005060CR
FCC ID: UCZ-AX62TR-Z
IC : 8575A-AX62TRZ
Applicant: LOREX Technology Inc.
Address of Applicant: 250 Royal Crest Court, Markham, ON L3R 3S1 Canada?
Manufacturer: Lorex Technology Inc.
Address of Manufacturer: 250 Royal crest Court, Markham, L3R 3S1 Canada
Equipment Under Test (EUT):
EUT Name: Home Center Extender
Model No.: AX62TR-Z
Trade mark: LOREX
Standard(s) : FCC Rules 47 CFR §2.1091
 KDB447498 D01 General RF Exposure Guidance v06
 RSS-102 Issue 5 (March 2015)
Date of Receipt: 2020-06-30
Date of Test: 2020-06-30 to 2020-07-20
Date of Issue: 2020-07-23

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

Parlam Zhan

Parlam Zhan
E&E Section Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.




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Revision Record			
Version	Description	Date	Remark
00	Original	2020-07-23	/

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



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3 General Information

3.1 General Description of E.U.T.

Power supply:	DC 5V by Adapter Adapter: Model: NBS10B050200VUU INPUT: AC 100~240 50/60Hz OUTPUT: DC 5V/2A
Serial Number:	ND012006033966
Firmware Version:	V1.000.0000001.4

3.2 Technical Specifications

2.4GHz

Antenna Gain:	Antenna 1:2.2dBi Antenna 2:2.2dBi Directional gain:5.21dBi
Antenna Type:	Antenna 1: PIFA Antenna Antenna 2: PIFA 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):11 802.11n(HT40):7
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz 802.11n(HT40): 2422MHz to 2452MHz

BLE

Antenna Gain:	1.3dBi
Antenna Type:	PIFA Antenna
Bluetooth Version:	V5.0 LE
Channel Spacing:	2MHz
Modulation Type:	GFSK
Number of Channels:	40
Operation Frequency:	2402MHz to 2480MHz



5G

Operation Frequency:	Band	Mode	Frequency Range(MHz)	Number of channels
	Band 1	802.11a/n(HT20)/ac(HT20)	5180-5240	4
		802.11n(HT40)/ac(HT40)	5190-5230	2
		802.11ac(HT80)	5210	1
	Band 4	802.11a/n(HT20)/ac(HT20)	5745-5825	5
		802.11n(HT40)/ac(HT40)	5755-5795	2
		802.11ac(HT80)	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(HT20): 20MHz 802.11n(HT40)/ac(HT40): 40MHz 802.11ac(HT80): 80MHz			
Data Rate:	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: MCS0-7 802.11ac: MCS0-9			
Antenna Gain:	Antenna 1: 3.8dBi; Antenna 2: 3.8dBi Directional gain: 3.8dBi			
Antenna Type:	Antenna 1: PIFA Antenna Antenna 2: PIFA 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.

CAB Identifier: CN0072.

- **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-1600, C-1707, T-1499, 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 4.53 W

5 Measurement and Calculation

5.1 Maximum transmit power

The Power Data is based on the RF Test Report SHEM200600506001-2.4GHz

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]
11BSISO	2412	18.30	19.45	NA	67.61	88.10	N/A
11BSISO	2437	19.65	19.57	NA	92.26	90.57	N/A
11BSISO	2462	20.37	20.07	NA	108.89	101.62	N/A
11GSISO	2412	20.85	20.35	NA	121.62	108.39	N/A
11GSISO	2437	21.13	21.01	NA	129.72	126.18	N/A
11GSISO	2462	20.50	21.11	NA	112.20	129.12	N/A
11N20MIMO	2412	20.64	21.16	23.92	115.88	130.62	246.50
11N20MIMO	2437	21.04	20.88	24.97	127.06	122.46	249.52
11N20MIMO	2462	20.50	20.95	26.24	112.20	124.45	236.65
11N40MIMO	2422	20.28	20.81	25.56	106.66	120.50	227.16
11N40MIMO	2437	20.32	20.40	26.37	107.65	109.65	217.29
11N40MIMO	2452	20.35	20.10	27.24	108.39	102.33	210.72

The Power Data is based on the RF Test Report SHEM200600506002-BLE

Test Mode	Channel	Antenna 1 Power[dBm]	Antenna 1 Power[mW]
1M	2402	9.21	8.34
1M	2440	7.67	5.85
1M	2480	8.57	7.19



5GHz for FCC:

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	13.66	13.52	N/A	23.23	22.49	N/A
11A	5200	13.95	13.74	N/A	24.83	23.66	N/A
11A	5240	14.75	13.67	N/A	29.85	23.28	N/A
11A	5745	20.54	20.23	N/A	113.24	105.44	N/A
11A	5785	20.20	19.33	N/A	104.71	85.70	N/A
11A	5825	19.31	18.61	N/A	85.31	72.61	N/A
11N20MIMO	5180	8.85	12.08	13.77	7.67	16.14	23.82
11N20MIMO	5200	9.39	12.02	13.91	8.69	15.92	24.61
11N20MIMO	5240	9.70	11.69	13.82	9.33	14.76	24.09
11N20MIMO	5745	20.65	20.24	23.46	116.14	105.68	221.83
11N20MIMO	5785	20.12	19.42	22.79	102.80	87.50	190.30
11N20MIMO	5825	19.36	18.63	22.02	86.30	72.95	159.24
11N40MIMO	5190	9.35	12.12	13.96	8.61	16.29	24.90
11N40MIMO	5230	9.86	12.25	14.23	9.68	16.79	26.47
11N40MIMO	5755	20.39	19.82	23.12	109.40	95.94	205.34
11N40MIMO	5795	19.83	19.38	22.62	96.16	86.70	182.86
11AC20MIMO	5180	10.46	10.15	13.32	11.12	10.35	21.47
11AC20MIMO	5200	10.70	10.45	13.59	11.75	11.09	22.84
11AC20MIMO	5240	11.10	10.84	13.98	12.88	12.13	25.02
11AC20MIMO	5745	20.50	20.53	23.53	112.20	112.98	225.18
11AC20MIMO	5785	19.44	19.32	22.39	87.90	85.51	173.41
11AC20MIMO	5825	19.28	18.69	22.01	84.72	73.96	158.68
11AC40MIMO	5190	10.39	10.08	13.25	10.94	10.19	21.13
11AC40MIMO	5230	9.60	12.16	14.08	9.12	16.44	25.56
11AC40MIMO	5755	19.53	19.82	22.69	89.74	95.94	185.68
11AC40MIMO	5795	19.88	19.26	22.59	97.27	84.33	181.61
11AC80MIMO	5210	9.60	12.75	14.46	9.12	18.84	27.96
11AC80MIMO	5775	19.11	18.48	21.82	81.47	70.47	151.94



5GHz EIPR for IC:

Test Mode	Frequency (MHz)	Tx Type	Measured Output Power (dBm)			EIRP (dBm)			EIRP (mw)		
			Ant 1	Ant 2	Total	Ant 1	Ant 2	Total	Ant 1	Ant 2	Total
802.11a	5180	SISO	13.66	13.52	/	17.46	17.32	/	55.72	53.95	/
	5200	SISO	13.95	13.74	/	17.75	17.54	/	59.57	56.75	/
	5240	SISO	14.75	13.67	/	18.55	17.47	/	71.61	55.85	/
	5745	SISO	20.54	20.23	/	/	/	/	/	/	/
	5785	SISO	20.2	19.33	/	/	/	/	/	/	/
	5825	SISO	19.31	18.61	/	/	/	/	/	/	/
802.11n (HT20)	5180	MIMO	8.85	12.08	13.77	12.65	15.88	17.57	18.41	38.73	57.15
	5200	MIMO	9.39	12.02	13.91	13.19	15.82	17.71	20.84	38.19	59.02
	5240	MIMO	9.7	11.69	13.82	13.5	15.49	17.62	22.39	35.40	57.81
	5745	MIMO	20.65	20.24	23.46	/	/	/	/	/	/
	5785	MIMO	20.12	19.42	22.79	/	/	/	/	/	/
	5825	MIMO	19.36	18.63	22.02	/	/	/	/	/	/
802.11n (HT40)	5190	MIMO	9.35	12.12	13.96	13.15	15.92	17.76	20.65	39.08	59.70
	5230	MIMO	9.86	12.25	14.23	13.66	16.05	18.03	23.23	40.27	63.53
	5755	MIMO	20.39	19.82	23.12	/	/	/	/	/	/
	5795	MIMO	19.83	19.38	22.62	/	/	/	/	/	/
802.11ac (VHT20)	5180	MIMO	10.46	10.15	13.32	14.26	13.95	17.12	26.67	24.83	51.52
	5200	MIMO	10.7	10.45	13.59	14.5	14.25	17.39	28.18	26.61	54.83
	5240	MIMO	11.1	10.84	13.98	14.9	14.64	17.78	30.90	29.11	59.98
	5745	MIMO	20.5	20.53	23.53	/	/	/	/	/	/
	5785	MIMO	19.44	19.32	22.39	/	/	/	/	/	/
	5825	MIMO	19.28	18.69	22.01	/	/	/	/	/	/
802.11ac (VHT40)	5190	MIMO	10.39	10.08	13.25	14.19	13.88	17.05	26.24	24.43	50.70
	5230	MIMO	9.6	12.16	14.08	13.4	15.96	17.88	21.88	39.45	61.38
	5755	MIMO	19.53	19.82	22.69	/	/	/	/	/	/
	5795	MIMO	19.88	19.26	22.59	/	/	/	/	/	/
802.11ac (VHT80)	5210	MIMO	9.6	12.75	14.46	13.4	16.55	18.26	21.88	45.19	66.99
	5775	MIMO	19.11	18.48	21.82	/	/	/	/	/	/

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 2.4G WiFi –Antenna1:

The max. antenna gain is 2.2 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
129.72	1.660	20	0.04283	1	Pass

For 2.4G WiFi –Antenna2:

The max. antenna gain is 2.2 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
130.62	1.660	20	0.04313	1	Pass

In MIMO mode:

The max. antenna gain is 5.2 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
249.52	3.311	20	0.16437	1	Pass

For BLE:

The max. antenna gain is 1.3 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
8.34	1.349	20	0.00224	1	Pass

For 5G WiFi–Antenna1:

The max. antenna gain is 3.8 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
116.14	2.399	20	0.05543	1	Pass

For 5G WiFi–Antenna2:

The max. antenna gain is 3.8 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
112.98	2.399	20	0.05392	1	Pass

In MIMO mode:

The max. antenna gain is 6.81 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
225.18	4.797	20	0.21491	1	Pass

2.4G WiFi, BLE and 5G WiFi modules can simultaneous transmitting, so the maximum rate of MPE is $0.16437/1.0+0.00224/1.0+0.21491/1.0=0.38 \leq 1.0$. according to the KDB447498 section 7.2 determine the device is exclusion from SAR test

For IC:

For BLE

$$E.I.R.P.= P \cdot G = 0.00834 \times 1.349 = 0.011W < 2.68W$$

For 2.4GHz WiFi SISO mode:

$$\text{Antenna 1: } E.I.R.P.= P \cdot G = 0.13 \times 1.660 = 0.216W < 2.68W$$

$$\text{Antenna 2: } E.I.R.P.= P \cdot G = 0.13 \times 1.660 = 0.216W < 2.68W$$

$$\text{For 2.4GHz WiFi MIMO mode: } E.I.R.P.= 0.25 \times 3.331 = 0.833 < 2.68W$$

For 5GHz WiFi SISO mode:

$$\text{Antenna 1: } E.I.R.P.= P \cdot G = 0.116 \times 2.399 = 0.278W < 4.53W$$

$$\text{Antenna 2: } E.I.R.P.= P \cdot G = 0.113 \times 2.399 = 0.271W < 4.53W$$

$$\text{For 5GHz WiFi MIMO mode: } E.I.R.P.= P \cdot G = 0.225 \times 4.797 = 1.08W < 4.53W$$

2.4G WiFi, BLE and 5G WIFI can simultaneous transmitting. But the maximum rate of MPE is $0.011/2.68+0.833/2.68+1.08/4.53=0.553 \leq 1.0$. the device is exclusion from SAR test.

--End of the Report--