RF EXPOSURE REPORT

Product:	Central Controller Unit
Model Name:	Lime-V3-US
FCC ID:	2APB2LIME-V3-US
Applicant:	Neutron Holdings, Inc.
Address:	85 2nd St, San Francisco, CA 94105 USA
Manufacturer:	MeiG Smart Technology Co., Ltd
Address:	No.146 Lingxia Rd, 4th Fenghuang Industrial Park, Fuyong Street, Bao'an District, Shenzhen, China.
Prepared by:	BV 7Layers Communications Technology (Shenzhen) Co. Ltd
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Report No.:	SA190729W007
Received Date:	Oct. 29, 2018
Test Date:	Oct. 30, 2018 ~ Nov. 18, 2018
Issued Date:	Aug. 07, 2019

This report should not be used by the client to claim product certification, approval, or endorsement by A2LA or any government agencies.

TABLE OF CONTENTS

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
SA181029W010	Original release	Nov. 19, 2018
SA190729W007	Based on the original product changed HW version & SW version & product name. In this report, All test data is copied from the original test report SA181029W010.	Aug. 07, 2019

1 CERTIFICATION

PRODUCT:	Central Controller Unit
BRAND NAME:	Lime
MODEL NAME:	Lime-V3-US
APPLICANT:	Neutron Holdings, Inc.
TESTED:	Oct. 30, 2018 ~ Nov. 18, 2018
TEST SAMPLE:	Production Unit
STANDARDS:	**FCC Part 2 (Section 2.1091)** **FCC OET Bulletin 65, Supplement C (01-01)** **KDB 447498 D01 General RF Exposure Guidance v06** IEEE C95.1

The above equipment has been tested by **BV 7Layers Communications Technology (Shenzhen) Co. Ltd** and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : _____ , **DATE:** Aug. 07, 2019

(Alex Chen/ Engineer)

APPROVED BY : _____ , **DATE:** Aug. 07, 2019

(Luke Lu/ Manager)

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Central Controller Unit	
BRAND NAME	Lime	
MODEL NAME	Lime-V3-US	
NOMINAL VOLTAGE	36Vdc (DC source) 3.7V (Li-ion, battery)	
OPERATING TEMPERATURE RANGE	-20 ~ 45℃	
MODULATION TYPE	**WLAN**	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
	BT_LE	BT-LE(GFSK) for DTS
	WCDMA	BPSK/QPSK
	LTE	QPSK
OPERATING FREQUENCY	**WLAN**	2412~ 2462MHz for 11b/g/n(HT20) 2422~ 2452MHz for 11b/g/n(HT40)
	BT_LE	2402MHz ~ 2480MHz
	WCDMA	1852.4MHz ~ 1907.6MHz (FOR WCDMA II) 1710.7MHz ~ 1754.3MHz (FOR WCDMA IV) 826.4MHz ~ 846.6MHz (FOR WCDMA V)
	LTE	1850.7MHz ~ 1909.3MHz (FOR LTE Band2) 1710.7MHz ~ 1754.3MHz (FOR LTE Band4) 699.7MHz ~ 715.3MHz (FOR LTE Band12) 779.5MHz ~ 784.5MHz (FOR LTE Band13) 706.5MHz ~ 713.5MHz (FOR LTE Band17)
ANTENNA GAIN	**WLAN**	PIFA Antenna with 4.6dBi gain
	BLE	PIFA Antenna with 4.4dBi gain
	WCDMA V	Fixed Internal Antenna with 2.2dBi gain
	WCDMA IV/ LTE Band 4	Fixed Internal Antenna with 3.1dBi gain
	WCDMA II/ LTE Band 2	Fixed Internal Antenna with 3.3dBi gain
	LTE Band 12/ LTE Band 17	Fixed Internal Antenna with 2.1dBi gain
	LTE Band 13	Fixed Internal Antenna with 2.3dBi gain
HW VERSION	V1.04	
SW VERSION	S_CCU_FW_AP_E_O_MEIG_V2_1.0.10	

I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

3 RF EXPOSURE

3.1 LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

FREQUENCY RANGE (MHz)	ELECTRIC FIELD STRENGTH (V/m)	MAGNETIC FIELD STRENGTH (A/m)	POWER DENSITY (mW/cm^2)	AVERAGE TIME (minutes)
LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE				
300-1500	…	…	F/1500	30
1500-100,000	…	…	1.0	30

F = Frequency in MHz

3.2 MPE CALCULATION FORMULA

Pd = (Pout*G) / (4*pi*r2)

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

3.3 CLASSIFICATION

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as **Module Approval**.

3.4 CONDUCTED POWER

WIFI 2.4G

802.11b 11b

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	11.86	N/A
6	2437	12.32	N/A
11	2462	11.51	N/A

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	9.35	N/A
6	2437	10.32	N/A
11	2462	9.71	N/A

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	9.48	N/A
6	2437	10.25	N/A
11	2462	9.68	N/A

802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
3	2422	9.35	N/A
6	2437	9.89	N/A
9	2452	9.90	N/A

BT-LE (GFSK)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
0	2402	2.25	N/A
19	2440	2.02	N/A
39	2480	1.73	N/A

Band	WCDMA II			WCDMA V		
Channel	9262	9400	9538	4132	4182	4233
Frequency (MHz)	1852.4	1880.0	1907.6	826.4	836.4	846.6
RMC 12.2K	22.68	**22.71**	22.56	22.65	22.63	**22.79**
	HSPA					
HSDPA Subtest-1	21.83	21.86	21.71	21.80	21.78	21.94
HSDPA Subtest-2	21.66	21.69	21.54	21.63	21.61	21.77
HSDPA Subtest-3	21.20	21.23	21.08	21.17	21.15	21.31
HSDPA Subtest-4	21.12	21.15	21.00	21.09	21.07	21.23
HSUPA Subtest-1	21.93	21.96	21.81	21.90	21.88	22.04
HSUPA Subtest-2	19.96	19.99	19.84	19.93	19.91	20.07
HSUPA Subtest-3	20.88	20.91	20.76	20.85	20.83	20.99
HSUPA Subtest-4	19.90	19.93	19.78	19.87	19.85	20.01
HSUPA Subtest-5	21.88	21.91	21.76	21.85	21.83	21.99

Band	WCDMA IV		
Channel	1312	1413	1513
Frequency (MHz)	1712.4	1732.6	1752.6
RMC 12.2K	22.61	22.56	**22.66**
HSPA			
HSDPA Subtest-1	21.76	21.71	21.81
HSDPA Subtest-2	21.59	21.54	21.64
HSDPA Subtest-3	21.13	21.08	21.18
HSDPA Subtest-4	21.05	21.00	21.10
HSUPA Subtest-1	21.86	21.81	21.91
HSUPA Subtest-2	19.89	19.84	19.94
HSUPA Subtest-3	20.81	20.76	20.86
HSUPA Subtest-4	19.83	19.78	19.88
HSUPA Subtest-5	21.81	21.76	21.86

LTE BAND 2

LTE Band 2							
BW	Modulation	RB Size	RB Offset	Low CH 18607 Frequency 1850.7 MHz	Mid CH 18900 Frequency 1880 MHz	High CH 19193 Frequency 1909.3 MHz	3GPP MPR (dB)
1.4MHz	QPSK	1	0	22.63	22.50	22.41	0
		1	2	22.56	22.43	22.34	0
		1	5	22.23	22.10	22.01	0
		3	0	21.58	21.45	21.36	0
		3	1	21.24	21.11	21.02	0
		3	3	21.31	21.18	21.09	0
		6	0	21.42	21.29	21.20	1
BW	Modulation	RB Size	RB Offset	Low CH 18615 Frequency 1851.5 MHz	Mid CH 18900 Frequency 1880 MHz	High CH 19185 Frequency 1908.5 MHz	3GPP MPR (dB)
3 MHz	QPSK	1	0	22.66	22.53	22.44	0
		1	7	22.59	22.46	22.37	0
		1	14	22.26	22.13	22.04	0
		8	0	21.61	21.48	21.39	1
		8	3	21.27	21.14	21.05	1
		8	7	21.34	21.21	21.12	1
		15	0	21.45	21.32	21.23	1

LTE Band 2							
BW	Modulation	RB Size	RB Offset	Low CH 18625	Mid CH 18900	High CH 19175	3GPP MPR (dB)
				Frequency 1852.5 MHz	Frequency 1880 MHz	Frequency 1907.5 MHz	
5 MHz	QPSK	1	0	22.68	22.55	22.46	0
		1	12	22.61	22.48	22.39	0
		1	24	22.28	22.15	22.06	0
		12	0	21.63	21.50	21.41	1
		12	6	21.29	21.16	21.07	1
		12	13	21.36	21.23	21.14	1
		25	0	21.47	21.34	21.25	1
BW	Modulation	RB Size	RB Offset	Low CH 18650	Mid CH 18900	High CH 19150	3GPP MPR (dB)
				Frequency 1855 MHz	Frequency 1880 MHz	Frequency 1905 MHz	
10 MHz	QPSK	1	0	22.70	22.57	22.48	0
		1	24	22.63	22.50	22.41	0
		1	49	22.30	22.17	22.08	0
		25	0	21.65	21.52	21.43	1
		25	12	21.31	21.18	21.09	1
		25	25	21.38	21.25	21.16	1
		50	0	21.49	21.36	21.27	1

LTE Band 2							
BW	Modulation	RB Size	RB Offset	Low CH 18675 Frequency 1857.5 MHz	Mid CH 18900 Frequency 1880 MHz	High CH 19125 Frequency 1902.5 MHz	3GPP MPR (dB)
15 MHz	QPSK	1	0	22.73	22.60	22.51	0
		1	37	22.66	22.53	22.44	0
		1	74	22.33	22.20	22.11	0
		36	0	21.68	21.55	21.46	1
		36	19	21.34	21.21	21.12	1
		36	39	21.41	21.28	21.19	1
		75	0	21.52	21.39	21.30	1
BW	Modulation	RB Size	RB Offset	Low CH 18700 Frequency 1860 MHz	Mid CH 18900 Frequency 1880 MHz	High CH 19100 Frequency 1900 MHz	3GPP MPR (dB)
20MHz	QPSK	1	0	**22.78**	22.65	22.56	0
		1	50	22.71	22.58	22.49	0
		1	99	22.38	22.25	22.16	0
		50	0	21.73	21.60	21.51	1
		50	25	21.39	21.26	21.17	1
		50	50	21.46	21.33	21.24	1
		100	0	21.57	21.44	21.35	1

LTE BAND 4

LTE Band 4							
BW	Modulation	RB Size	RB Offset	Low CH 19957	Mid CH 20175	High CH 20393	MPR
				Frequency 1710.7 MHz	Frequency 1732.5 MHz	Frequency 1754.3 MHz	
1.4MHz	QPSK	1	0	22.23	22.43	22.40	0
		1	2	22.00	22.20	22.17	0
		1	5	21.88	22.08	22.05	0
		3	0	20.98	21.18	21.15	0
		3	1	20.89	21.09	21.06	0
		3	3	20.67	20.87	20.84	0
		6	0	20.72	20.92	20.89	1
BW	Modulation	RB Size	RB Offset	Low CH 19965	Mid CH 20175	High CH 20385	MPR
				Frequency 1711.5 MHz	Frequency 1732.5 MHz	Frequency 1753.5 MHz	
3 MHz	QPSK	1	0	22.25	22.45	22.42	0
		1	7	22.02	22.22	22.19	0
		1	14	21.90	22.10	22.07	0
		8	0	21.00	21.20	21.17	1
		8	3	20.91	21.11	21.08	1
		8	7	20.69	20.89	20.86	1
		15	0	20.74	20.94	20.91	1

LTE Band 4							
BW	Modulation	RB Size	RB Offset	Low CH 19975	Mid CH 20175	High CH 20375	MPR
				Frequency 1712.5 MHz	Frequency 1732.5 MHz	Frequency 1752.5 MHz	
5 MHz	QPSK	1	0	22.28	22.48	22.45	0
		1	12	22.05	22.25	22.22	0
		1	24	21.93	22.13	22.10	0
		12	0	21.03	21.23	21.20	1
		12	6	20.94	21.14	21.11	1
		12	13	20.72	20.92	20.89	1
		25	0	20.77	20.97	20.94	1
BW	Modulation	RB Size	RB Offset	Low CH 20000	Mid CH 20175	High CH 20350	MPR
				Frequency 1715 MHz	Frequency 1732.5 MHz	Frequency 1750 MHz	
10 MHz	QPSK	1	0	22.32	22.52	22.49	0
		1	24	22.09	22.29	22.26	0
		1	49	21.97	22.17	22.14	0
		25	0	21.07	21.27	21.24	1
		25	12	20.98	21.18	21.15	1
		25	25	20.76	20.96	20.93	1
		50	0	20.81	21.01	20.98	1

LTE Band 4							
BW	Modulation	RB Size	RB Offset	Low CH 20025	Mid CH 20175	High CH 20325	MPR
				Frequency 1717.5 MHz	Frequency 1732.5 MHz	Frequency 1747.5 MHz	
15 MHz	QPSK	1	0	22.34	22.54	22.51	0
		1	37	22.11	22.31	22.28	0
		1	74	21.99	22.19	22.16	0
		36	0	21.09	21.29	21.26	1
		36	19	21.00	21.20	21.17	1
		36	39	20.78	20.98	20.95	1
		75	0	20.83	21.03	21.00	1
BW	Modulation	RB Size	RB Offset	Low CH 20050	Mid CH 20175	High CH 20300	MPR
				Frequency 1720 MHz	Frequency 1732.5 MHz	Frequency 1745 MHz	
20MHz	QPSK	1	0	22.41	**22.61**	22.58	0
		1	50	22.18	22.38	22.35	0
		1	99	22.06	22.26	22.23	0
		50	0	21.16	21.36	21.33	1
		50	25	21.07	21.27	21.24	1
		50	50	20.85	21.05	21.02	1
		100	0	20.90	21.10	21.07	1

LTE BAND 12

LTE Band 12							
BW	Modulation	RB Size	RB Offset	Low CH 23017 Frequency 699.7 MHz	Mid CH 23095 Frequency 707.5 MHz	High CH 23173 Frequency 715.3 MHz	MPR
1.4 MHz	QPSK	1	0	22.17	22.11	22.23	0
		1	2	22.46	22.40	22.52	0
		1	5	22.33	22.27	22.39	0
		3	0	21.40	21.34	21.46	0
		3	1	21.43	21.37	21.49	0
		3	3	21.35	21.29	21.41	0
		6	0	21.42	21.36	21.48	1
BW	Modulation	RB Size	RB Offset	Low CH 23025 Frequency 700.5 MHz	Mid CH 23095 Frequency 707.5 MHz	High CH 23165 Frequency 714.5 MHz	MPR
3 MHz	QPSK	1	0	22.20	22.14	22.26	0
		1	7	22.49	22.43	22.55	0
		1	14	22.36	22.30	22.42	0
		8	0	21.43	21.37	21.49	1
		8	3	21.46	21.40	21.52	1
		8	7	21.38	21.32	21.44	1
		15	0	21.45	21.39	21.51	1

LTE Band 12							
BW	Modulation	RB Size	RB Offset	Low CH 23035 Frequency 701.5 MHz	Mid CH 23095 Frequency 707.5 MHz	High CH 23155 Frequency 713.5 MHz	MPR
5 MHz	QPSK	1	0	22.26	22.20	22.32	0
		1	12	22.55	22.49	22.61	0
		1	24	22.42	22.36	22.48	0
		12	0	21.49	21.43	21.55	1
		12	6	21.52	21.46	21.58	1
		12	13	21.44	21.38	21.50	1
		25	0	21.51	21.45	21.57	1
BW	Modulation	RB Size	RB Offset	Low CH 23060 Frequency 704 MHz	Mid CH 23095 Frequency 707.5 MHz	High CH 23130 Frequency 711 MHz	MPR
10 MHz	QPSK	1	0	22.29	22.23	22.35	0
		1	24	22.58	22.52	**22.64**	0
		1	49	22.45	22.39	22.51	0
		25	0	21.52	21.46	21.58	1
		25	12	21.55	21.49	21.61	1
		25	25	21.47	21.41	21.53	1
		50	0	21.54	21.48	21.60	1

LTE BAND 13

LTE Band 13							
BW	**Modulation**	**RB Size**	**RB Offset**	**Low CH 23205**	**Mid CH 23230**	**High CH 23255**	**MPR**
				Frequency 779.5 MHz	**Frequency 782.0 MHz**	**Frequency 784.5 MHz**	
5 MHz	QPSK	1	0	22.09	22.19	22.06	0
		1	12	22.38	22.48	22.35	0
		1	24	22.25	22.35	22.22	0
		12	0	21.28	21.38	21.25	1
		12	6	21.31	21.41	21.28	1
		12	13	21.27	21.37	21.24	1
		25	0	21.29	21.39	21.26	1
BW	**Modulation**	**RB Size**	**RB Offset**	**CH**	**CH 23230**	**CH**	**MPR**
				Frequency MHz	**Frequency 782.0 MHz**	**Frequency MHz**	
10 MHz	QPSK	1	0	-	22.22	-	0
		1	24	-	**22.51**	-	0
		1	49	-	22.38	-	0
		25	0	-	21.41	-	1
		25	12	-	21.44	-	1
		25	25	-	21.40	-	1
		50	0	-	21.42	-	1

LTE BAND 17

LTE Band 17							
BW	Modulation	RB Size	RB Offset	Low CH 23755 Frequency 706.5 MHz	Mid CH 23790 Frequency 710 MHz	High CH 23825 Frequency 713.5 MHz	MPR
5 MHz	QPSK	1	0	22.54	22.32	22.27	0
		1	12	22.50	22.28	22.23	0
		1	24	22.47	22.25	22.20	0
		12	0	21.44	21.22	21.17	1
		12	6	21.47	21.25	21.20	1
		12	13	21.45	21.23	21.18	1
		25	0	21.48	21.26	21.21	1
BW	Modulation	RB Size	RB Offset	Low CH 23780 Frequency 709 MHz	Mid CH 23790 Frequency 710 MHz	High CH 23800 Frequency 711 MHz	MPR
10 MHz	QPSK	1	0	**22.58**	22.36	22.31	0
		1	24	22.54	22.32	22.27	0
		1	49	22.51	22.29	22.24	0
		25	0	21.48	21.26	21.21	1
		25	12	21.51	21.29	21.24	1
		25	25	21.49	21.27	21.22	1
		50	0	21.52	21.30	21.25	1

3.5 CALCULATION RESULT OF MAXIMUM CONDUCTED POWER

TUNE-UP POWER TABLE

Band	Frequency (MHz)	Operating Mode	Tune-Up Power And Tolerance (dBm)
BLE	2402	GFSK	2.0 ± 0.5
WIFI 2.4G	2437	11b	12.0 ± 1.0
WCDMA II	1880	RMC12.2K	23.0 ± 0.5
WCDMA IV	1752.6	RMC12.2K	23.0 ± 0.5
WCDMA V	846.6	RMC12.2K	23.0 ± 0.5
Band2	1860	QPSK	22.5 ± 1.0
Band4	1732.5	QPSK	22.5 ± 1.0
Band12	711	QPSK	22.5 ± 1.0
Band13	782	QPSK	22.5 ± 1.0
Band17	709	QPSK	22.5 ± 1.0

CALCULATION RESUL

WIFI

Band	Frequency (MHz)	Operating Mode	Antenna Gain (dBi)	Tune-up Power (dBm)	E.I.R.P Power (mW)	Power Density (mW/cm^2)	limit (mW/cm^2)	PASS / FAIL
BLE	2402	GFSK	4.4	2.5	4.898	0.001	1.00	PASS
WIFI 2.4G	2437	11b	4.6	13.0	57.544	0.011	1.00	PASS

WCDMA

Band	Frequency (MHz)	Operating Mode	Antenna Gain (dBi)	Tune-up Power (dBm)	E.I.R.P Power (mW)	Power Density (mW/cm^2)	limit (mW/cm^2)	PASS / FAIL
WCDMA II	1880	RMC12.2K	3.3	23.5	478.630	0.095	1.00	PASS
WCDMA IV	1752.6	RMC12.2K	3.1	23.5	457.088	0.091	1.00	PASS
WCDMA V	846.6	RMC12.2K	2.2	23.5	371.535	0.074	0.56	PASS

LTE

Band	Frequency (MHz)	Operating Mode	Antenna Gain (dBi)	Tune-up Power (dBm)	E.I.R.P Power (mW)	Power Density (mW/cm^2)	limit (mW/cm^2)	PASS / FAIL
Band2	1860	QPSK	3.3	23.5	478.630	0.095	1.00	PASS
Band4	1732.5	QPSK	3.1	23.5	457.088	0.091	1.00	PASS
Band12	711	QPSK	2.1	23.5	363.078	0.072	0.47	PASS
Band13	782	QPSK	2.3	23.5	380.189	0.076	0.52	PASS
Band17	709	QPSK	2.1	23.5	363.078	0.072	0.47	PASS

3.6 CONCLUSION OF SIMULTANEOUS TRANSMITTER

Both of the WLAN and plug-in device can transmit simultaneously, the formula of calculated the MPE is:

CPD1/LPD1+CPD2/LPD2+……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

Therefore the worst-case situation is 0.001/1.00+0.011/1.00+0.095/1.00+0.091/1.00+0.074/0.56+0.095/1.00+0.091/1.00+ 0.072/0.47+0.076/0.52+0.0724/0.47=0.969531, which is less than “1”, This confirmed that the device comply with FCC 1.1310 MPE limit.

--END--