SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch

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RF Exposure Evaluation Report

Application No.:	SZEM1708008941CR
Applicant:	Alliance Laundry Systems LLC
Address of Applicant:	PO Box 990, Shepard St., Ripon, Wisconsin 54971, United States
Manufacturer:	Alliance Laundry Systems LLC
Address of Manufacturer:	PO Box 990, Shepard St., Ripon, Wisconsin 54971, United States
Factory:	Embest Technology Co., Ltd
Address of Factory:	Tower B 4/F, Shanshui Building, Nanshan Yungu Innovation Industry Park, Liuxian Ave. No.1183, Nanshan District, Shenzhen, Guangdong, China
Equipment Under Test (EUT):	
EUT Name:	Network Gateway
Model No.:	204145
FCC ID:	2ANOT-204145
Standard(s) :	47 CFR Part 1.1307
	47 CFR Part 1.1310
Date of Receipt:	2017-08-24
Date of Test:	2017-09-04 to 2017-09-07
Date of Issue:	2017-09-28
Test Result:	**Pass***

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

Jack Zhang
EMC Laboratory 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.

2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2017-09-28		Original

Authorized for issue by:				
				
		Hank Yan /Project Engineer		
				
		Eric Fu /Reviewer		

3 Contents

4 General Information

4.1 General Description of EUT

Power supply:	DC 5.0V via Micro-USB port
For Bluetooth Classic:	
Frequency Range:	2402MHz to 2480MHz
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK
Number of Channels:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Antenna Type:	Chip Antenna
Antenna Gain:	1.5dBi
For BLE:	
Frequency Range:	2402MHz to 2480MHz
Bluetooth Version:	4.1
Modulation Type:	GFSK
Number of Channels:	40
Antenna Type:	Chip Antenna
Antenna Gain:	1.5dBi
For WiFi: (on-board):	
Type of Modulation:	IEEE for 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE for 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n (HT20): OFDM (64QAM, 16QAM, QPSK, BPSK)
Operating Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Number:	IEEE 802.11b/g, IEEE 802.11n(HT20): 11 Channels
Channels Step:	Channels with 5MHz step
Antenna Type:	Chip Antenna
Antenna Gain:	1.5dBi
For WiFi: (Certified module: FCC ID:VVX-LM820-0462):	
Type of Modulation:	IEEE for 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE for 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n (HT20/HT40): OFDM (64QAM, 16QAM, QPSK, BPSK)
Operating Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2412MHz to 2452MHz
Channel Number:	IEEE 802.11b/g, IEEE 802.11n(HT20): 11 Channels IEEE 802.11n(HT40): 7 Channels
Channels Step:	Channels with 5MHz step
Antenna Type:	Ceramic Antenna
Antenna Gain:	5dBi

For Zigbee: (Certified module:FCC ID:TFB-PROFLEX1):

Type of Modulation:	O-QPSK
Operating Frequency:	2405MHz to 2475MHz
Channel Number:	15
Channels Step:	Channels with 5MHz step
Antenna Type:	Dipole Antenna (RP-SMA Connector)
Antenna Gain:	2dBi

4.2 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

4.3 Test Facility

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

• **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 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. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• **VCCI**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

• **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

4.4 Deviation from Standards

None.

4.5 Abnormalities from Standard Conditions

None.

4.6 Other Information Requested by the Customer

None.

5 RF Exposure Evaluation

5.1 RF Exposure Compliance Requirement

5.1.1 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: Pd = (Pout*G)/(4* Pi * R 2)

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

Pd id 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.

5.1.2 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

1) exposure conditions for standalone operations

For BT:

Antenna Gain: 1.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.41 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Frequency (MHz)	Max. Conducted Peak Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit	MPE Ratio	Result
Highest	2480	8.28	6.73	0.002	1	0.002	PASS

Note: Refer to report No. SZEM170800894102 for EUT test Max Conducted Peak Output Power value.

The distancer (5th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For BLE:

Antenna Gain: 1.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.41 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Frequency (MHz)	Max. Conducted Peak Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit	MPE Ratio	Result
Highest	2480	8.31	6.78	0.002	1	0.002	PASS

Note: Refer to report No. SZEM170800894103 for EUT test Max Conducted Peak Output Power value.

The distancer (5th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For WiFi (on-board):

Antenna Gain: 1.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.41 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Frequency (MHz)	Max. Conducted Peak Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit	MPE Ratio	Result
Highest	2462	24.17	6.78	0.073	1	0.073	PASS

Note: Refer to report No. SZEM170800894104 for EUT test Max Conducted Peak Output Power value.

The distancer (5th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For WiFi module (Certified module:FCC ID: VVX-LM820-0462):

Antenna Gain: 5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.16 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Frequency (MHz)	Max. Conducted Peak Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit	MPE Ratio	Result
Lowest	2412	19.450	88.105	0.055	1	0.055	PASS

Note: Refer to report of FCC ID: VVX-LM820-0462 for EUT test Max Conducted Peak Output Power value.

The distancer (5th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For Zigbee (Certified module:FCC ID:TFB-PROFLEX1):

Antenna Gain: 2dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.58 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Frequency (MHz)	Max. Conducted Peak Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit	MPE Ratio	Result
Low	2420	19.950	98.855	0.031	1	0.031	PASS

Note: Refer to report of FCC ID: TFB-PROFLEX1 for EUT test Max Conducted Peak Output Power value.

The distancer (5th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

2) exposure conditions for simultaneous transmission operations

Simultaneous transmission MPE test is not required, because the Max. sum of the MPE ratios for WiFi and Zigbee is 0.073+0.055+0.031=0.159 < 1