

SGS-CSTC Standards Technical Services Co., Ltd.

Shenzhen Branch



Report No.: SZEM181200008505

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RF Exposure Evaluation Report

Application No.: SZEM1812000085CR

Applicant: Linkk Sp. z o.o.

Address of Applicant: Karola Olszewskiego 6, Kielce, 25-663, Poland

Manufacturer: Linkk Sp. z o.o.

Address of Manufacturer: Karola Olszewskiego 6, Kielce, 25-663, Poland

Factory: Linkk Sp. z o.o.

Address of Factory: Karola Olszewskiego 6, Kielce, 25-663, Poland

Equipment Under Test (EUT):

Product Name:Bluetooth GatewayModel No.:BG-6ULX-C-LinkkFCC ID:2AR2C-BG6ULXCStandards:47 CFR Part 1.1307

47 CFR Part 1.1310

Date of Receipt: 2018-12-20

Date of Test: 2019-01-28 to 2019-03-11

Date of Issue: 2019-03-19

Test Result : PASS*

Keny Xu EMC Laboratory Manager

Ceny. Ku



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



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2 Version

	Revision Record						
Version	Chapter	Date	Modifier	Remark			
01		2019-03-19		Original			

Authorized for issue by:		
	60.6i	
	Leo Li /Project Engineer	
	EvicFu	
	Eric Fu /Reviewer	



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	4.1 GENERAL DESCRIPTION OF EUT



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4 General Information

4.1 General Description of EUT

Power supply:	DC 5V
	Adapter Model: FJ-SW266B50502000U
	Input: AC100-240V~50/60Hz 0.4A Max
	Output: DC 5V 2000mA
Cable:	USB cable: 100cm unshielded
For BLE:	
Bluetooth Version:	V4.2 LE
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Channel Spacing:	2MHz
Number of Channels:	40
Antenna Type:	PCB Antenna
Antenna Gain:	-1.616dBi
For 2.4G wifi:	
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
Channel Spacing:	5MHz
Antenna Type:	PCB Antenna
Antenna Gain:	-1.616dBi



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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 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 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.

Innovation, Science and Economic Development Canada

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

CAB identifier: CN0006.

IC#: 4620C.



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4.4 Deviation from Standards

None

4.5 Abnormalities from Standard Conditions

None.

4.6 Other Information Requested by the Customer

None



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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/cm²)	Averaging time (minutes)
(A) Lim	its for Occupational	/Controlled Exposu	res	
0.3–3.0 3.0–30 30–300 300–1500 1500–100,000	614 1842/f 61.4	1.63 4.89/f 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 6
(B) Limits	for General Populati	on/Uncontrolled Exp	oosure	
0.3–1.34	614 824/f 27.5	1.63 2.19/f 0.073	*(100) *(180/f²) 0.2 f/1500 1.0	30 30 30 30 30

F= Frequency in MHz

Friis Formula

Friis transmission 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

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.



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4.1.3 EUT RF Exposure Evaluation

For BLE: Module 1:

Antenna Gain: -1.616dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 0.69 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Frequency Max Conducted		Output Power	Power Density	Limit	Result
	(MHz)	Peak Output	to Antenna	at R = 20 cm	(mW/cm ²)	
		Power (dBm)	(mW)	(mW/cm ²)		
Lowest	2402	0.96	1.25	0.000172	1.0	PASS

Note: Refer to report No. SZEM181200008502 for EUT test Max Conducted Peak Output Power value.

The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

Module 2:

Antenna Gain: -1.616dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 0.69 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Frequency (MHz)	Max Conducted Peak Output	Output Power to Antenna	Power Density at R = 20 cm	Limit (mW/cm²)	Result
		Power (dBm)	(mW)	(mW/cm²)		
Lowest	2440	0.86	1.22	0.000167	1.0	PASS

Note: Refer to report No. SZEM181200008502 for EUT test Max Conducted Peak Output Power value.

The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.



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For 2.4G WiFi:

Antenna Gain: -1.616dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 0.69 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Frequency	Max Conducted	Output Power	Power Density	Limit	Result
	(MHz)	Peak Output	to Antenna	at R = 20 cm	(mW/cm ²)	
		Power (dBm)	(mW)	(mW/cm²)		
Lowest	2462	18.62	72.78	0.01	1.0	PASS

Note: Refer to report No. SZEM181200008503 for EUT test Max Conducted Peak Output Power value. The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

The WiFi module, BLE 1 module and BLE 2 module can transmit simultaneously, so the total Power Density at R = 20 cm is (0.000172 + 0.000167 + 0.01) = 0.010339 < 1.

In conclusion, RF Exposure Evaluation result is Pass.

- End of the Report -



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