



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

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Report No.: SZEM151000664405
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RF Exposure Evaluation Report

Application No.: SZEM1510006644CR
Applicant: Seeed Technology Co., Ltd
Manufacturer/Factory: Seeed Technology Co., Ltd
Product Name: Rephone Kit Create (Xadow GSM + BLE)
Model No.(EUT): Xadow GSM + BLE v1.0
Add Model No.: Xadow GSM + BLE v1.1
Trade Mark: Seeedstudio
FCC ID: Z4TXADOW-GSMBTV10
Standards: 47 CFR Part 1.1307 (2014)
47 CFR Part 1.1310 (2014)
KDB447498D01 General RF Exposure Guidance v06
Date of Receipt: 2015-11-23
Date of Test: 2015-11-25 to 2016-01-06
Date of Issue: 2016-01-12

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

Authorized Signature:



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.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00		2016-01-12		Original

Authorized for issue by:			
		<i>Gebin Sun</i>	2016-01-06
Tested By		(Gebin Sun) /Project Engineer	Date
		<i>Jade Chen</i>	2016-01-12
Prepared By		(Jade Chen) /Clerk	Date
		<i>Eric Fu</i>	2016-01-12
Checked By		(Eric Fu) /Reviewer	Date



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4 General Information

4.1 Client Information

Applicant:	Seeed Technology Co., Ltd
Address of Applicant:	F5, Building 8, Shiling Industrial Park, Xinwei, Number32, Tongsha Road Xili Town, Nanshan District, Shenzhen, China. P.R.C
Manufacturer:	Seeed Technology Co., Ltd
Address of Manufacturer:	F5, Building 8, Shiling Industrial Park, Xinwei, Number32, Tongsha Road Xili Town, Nanshan District, Shenzhen, China. P.R.C
Factory:	Seeed Technology Co., Ltd
Address of Factory:	F5, Building 8, Shiling Industrial Park, Xinwei, Number32, Tongsha Road Xili Town, Nanshan District, Shenzhen, China. P.R.C

4.2 General Description of EUT

Product Name:	Rephone Kit Create (Xadow GSM + BLE)
Model No.:	Xadow GSM + BLE v1.0
Trade Mark:	Seeedstudio
Bluetooth Version:	BT4.0 Dual mode
Sample Type:	Mobile device
Antenna Type:	Integral
Antenna Gain:	0.5dBi
Power Supply:	DC3.7V (1 x 3.7V Rechargeable battery) 520mAh Battery: Charge by DC 5V
For Classic Mode	
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
For BLE Mode	
Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	BT4.0 Dual mode
Modulation Type:	GFSK
Number of Channel:	40



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For GSM		
Support Frequency Range:	GSM850	Transmission (TX): 824 to 849 MHz
		Receiving (RX): 869 to 894 MHz
	GSM1900	Transmission (TX): 1850 to 1910 MHz
		Receiving (RX): 1930 to 1990 MHz

Remark:

Model No.: Xadow GSM + BLE v1.0, Xadow GSM + BLE v1.1

Only the model Xadow GSM + BLE v1.0 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being of sick-screen.

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4.3 Test Location

All tests were performed at:

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

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.

4.4 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 – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 556682.

- **Industry Canada (IC)**

The 3m Semi-anechoic chambers and the 10m Semi-anechoic chambers 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-2, 4620C-3.

4.5 Deviation from Standards

None.

4.6 Abnormalities from Standard Conditions

None.

4.7 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: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is 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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5.1.3 EUT RF Exposure Evaluation

1) . exposure conditions for standalone operations

Antenna Gain: 0.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.12 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

For Classic Mode

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 Ratios	Result
Middle	2441	5.45	3.51	0.0003	1.0	0.0003	PASS

Note: Refer to report No. SZEM151000664403 for EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation

For BLE Mode

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 Ratios	Result
Lowest	2402	5.39	3.46	0.0003	1.0	0.0003	PASS

Note: Refer to report No. SZEM151000664402 for EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation

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For GSM

GSM 850				
Burst Output Power(dBm)		Division Factors	Frame-Average Output Power(dBm)	
GSM(CS)		33.41	-9.19	24.22
GPRS (GMSK)	1 TX Slot	33.40	-9.19	24.21
	2 TX Slots	32.15	-6.18	25.97
	3 TX Slots	31.08	-4.42	26.66
	4 TX Slots	30.23	-3.17	27.06

GSM 1900				
Burst Output Power(dBm)		Division Factors	Frame-Average Output Power(dBm)	
GSM(CS)		31.02	-9.19	21.83
GPRS (GMSK)	1 TX Slot	30.98	-9.19	21.79
	2 TX Slots	29.85	-6.18	23.67
	3 TX Slots	28.71	-4.42	24.29
	4 TX Slots	27.72	-3.17	24.55

Frequency band	Test ch./Freq.	Max Conducted Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm2)	Limit	MPE Ratios	Result
GSM850 (GPRS)	251/848.8	27.06	508.159	0.0505	0.57	0.089	PASS
GSM1900 (GPRS)	661/1880.0	24.55	285.102	0.0284	1.0	0.028	PASS

Note: Refer to Appendix B of Test Report SZEM151000664404 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.

2) . exposure conditions for simultaneous transmission operations

Simultaneous transmission MPE test is not required,because the Max. sum of the MPE ratios for GSM and BT is 0.089+0.0003=0.0893<1

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