



RF Exposure Evaluation Report

Application No.: SZEM1810009316CR
Applicant: Ninebot (Changzhou) Tech Co., Ltd
Address of Applicant: 16F-17F, Block A, Building 3, Changwu Mid Road 18#, Wujin Dist., Changzhou, Jiangsu, China
Manufacturer: Ninebot (Changzhou) Tech Co., Ltd
Address of Manufacturer: 16F-17F, Block A, Building 3, Changwu Mid Road 18#, Wujin Dist., Changzhou, Jiangsu, China
Equipment Under Test (EUT):
EUT Name: IoT device
Model No.: PJ22IOT
Trade mark: Segway
FCC ID: 2ALS8-NB2588
Standards: 47 CFR Part 1.1307
47 CFR Part 1.1310
Date of Receipt: 2018-10-29
Date of Test: 2018-11-01 to 2018-12-14
Date of Issue: 2018-12-26

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

Keny Xu

Keny Xu
EMC Laboratory Manager





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Shenzhen Branch EMC Laboratory

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2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2018-12-26		Original

Authorized for issue by:			
			
		<hr/> Vincent Chen /Project Engineer	
			
		<hr/> Eric Fu /Reviewer	





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4 General Information

4.1 General Description of EUT

Power supply:	Powered by DC 3.7V Lithium ion Battery, Charging by DC 36V from external power input
Sample Type:	Fixed production
For BLE:	
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V4.0
Channel Spacing:	2MHz
Modulation Type:	GFSK
Number of Channels:	40
Antenna Type:	PCB Antenna
Antenna Gain:	3dBi
For 3G:	
UMTS Operation Frequency Band:	UMTS FDD Band II/V
Modulation Type:	QPSK
Supported Channel Bandwidth:	5 MHz
UMTS Power Class:	Level 3
Designation of Emissions:	UMTS band II: 4M15F9W UMTS band V: 4M15F9W
Antenna Type:	PIFA Antenna
Antenna Gain:	WCDMA Band V: -0.3dBi WCDMA Band II: -0.3dBi
Extreme temp. Tolerance:	-30℃ to +50℃
Extreme vol. Limits:	3.2VDC to 4.3VDC (nominal: 3.7VDC)
For 4G:	
LTE Operation Frequency Band:	LTE FDD Band 2, 4, 12
Modulation Type:	QPSK, 16QAM
LTE Power Class:	Level 3
Antenna Type:	PIFA Antenna
Antenna Gain:	LTE Band 4: -0.2dBi LTE Band 2: -0.3dBi LTE Band 12: 0.2dBi



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Extreme temp. Tolerance:	-30 °C to +50 °C
Extreme vol. Limits:	3.2VDC to 4.3VDC (nominal: 3.7VDC)



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Member of the SGS Group (SGS SA)

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.

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/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.

FCC limit :

WCDMA band II and LTE FDD band 2: 1mW/cm²

WCDMA band V: 0.558mW/cm²

LTE FDD band 4: 1mW/cm²

LTE FDD band 12: 0.625mW/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

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

For BLE:

ANT: 3dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency (MHz)	Declared Max Average Output Power (including tune-up tolerance) (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	Result
2402MHz	-10.5	0.089	0.00004	1.0	PASS

Note: Refer to Tune-up information for EUT Declared Max. Average Peak Output Power value.

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

For WCDMA and 4G LTE:

Antenna Gain: WCDMA Band V/ II:-0.3dBi, LTE Band 4:-0.2dBi, LTE Band 2:-0.3dBi, LTE Band 12:0.2dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is WCDMA Band V/ II:0.96, LTE Band 4:0.95, LTE Band 2:0.96, LTE Band 12:1.05 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Test mode	Declared Max Average Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	Result
WCDMA II	23	199.53	0.037	1.0	PASS
WCDMA V	25	316.23	0.059	0.558	PASS
LTE FDD band 2	25	316.23	0.059	1.0	PASS
LTE FDD band 4	23.5	223.87	0.043	1.0	PASS
LTE FDD band 12	24.5	281.84	0.059	0.625	PASS

Note: Refer to Tune-up information for EUT Declared Max. Average 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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The simultaneous transmission result between of BLE, WCDMA:

The SAR Exclusion Threshold Level:

$$\begin{aligned} &= \text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2} \quad (\text{CPD} = \text{Calculation power density, LPD} = \text{Limit of power density}) \\ &= (0.00004/1) + (0.059/0.558) = 0.106 < 1.0 \end{aligned}$$

Since the source-based time-averaging conducted output power is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.

- End of the Report -



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