

SPECTRUM REPORT (4G)

Applicant: SHENZHEN WLINK TECHNOLOGY CO., LIMITED

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Manufacturer: SHENZHEN WLINK TECHNOLOGY CO., LIMITED

Address of Manufacturer: 319, YiBen Electronic Business Building, NO.1063 ChaGuang Road, XiLi, NanShan District, ShenZhen, China

Equipment Under Test (EUT)

Product Name: Industrial Cellular Modem

Model No.: WL-R220

Applicable standards: ETSI EN 301 908-1 V11.1.1 (2016-07)
ETSI EN 301 908-13 V11.1.1 (2016-07)

Date of sample receipt: June 27, 2017

Date of Test: June 28-July 04, 2017

Date of report issued: July 05, 2017

Test Result : PASS *

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

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 2014/53/EU are considered.



Robinson Lo

Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.



2 Version

Version No.	Date	Description
00	July 05, 2017	Original

Prepared By:

Edward.Pan

Date:

July 05, 2017

Project Engineer

Check By:

Andy. Wu

Date:

July 05, 2017

Reviewer

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4 Test Summary

Test Item	Test Requirement	Test method	Result
Receiver spurious emissions	ETSI EN 301 908-13 section 4.2.10	ETSI EN 301 908-13 section 5.3.9	N/A
Radiated emissions	ETSI EN 301 908-1 Section 4.2.2	ETSI EN 301 908-1 Section 5.3.1	Pass
Control and monitoring functions	ETSI EN 301 908-1 Section 4.2.4	ETSI EN 301 908-1 Section 5.3.3	Pass

5 General Information

5.1 General Description of EUT

Product Name:	Industrial Cellular Modem
Model No.:	WL-R220
Operation Frequency:	Band 1:1920MHz ~ 1980MHz Band 3:1710MHz ~ 1785MHz Band 7:2500MHz ~ 2570MHz Band 8: 880MHz ~ 915MHz Band 20:832MHz ~ 862MHz
Modulation Type:	QPSK, 16QAM, 64QAM
Antenna Type:	Integral Antenna
Antenna Gain:	1.0dBi(Band 1), 1.0dBi(Band 3), 1.0dBi(Band 7), 1.0dBi(Band 8), 1.0dBi(Band 20).
Power Supply:	Adapter Model No.: TS-A018-120015EJ Input: AC 100-240V, 50/60Hz, 0.5A Output: DC 12V, 1.5A

5.2 Description of Support Units

The EUT was test as an independent unit

5.3 Test Facility

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

- **FCC —Registration No.: 600491**

Global United Technology 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 files. Registration 600491, June 22, 2016.

- **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. Has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016.

5.4 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

5.5 Deviation from Standards

None

5.6 Other Information Requested by the Customer

None.

6 Test Instruments List

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 28 2017	June. 27 2018
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 28 2017	June. 27 2018
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June. 28 2017	June. 27 2018
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 28 2017	June. 27 2018
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 28 2017	June. 27 2018
9	Coaxial Cable	GTS	N/A	GTS211	June. 28 2017	June. 27 2018
10	Coaxial cable	GTS	N/A	GTS210	June. 28 2017	June. 27 2018
11	Coaxial Cable	GTS	N/A	GTS212	June. 28 2017	June. 27 2018
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 28 2017	June. 27 2018
13	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June. 28 2017	June. 27 2018
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 28 2017	June. 27 2018
15	Band filter	Amindeon	82346	GTS219	June. 28 2017	June. 27 2018
16	Constant temperature and humidity box	Oregon Scientific	BA-888	GTS248	June. 28 2017	June. 27 2018
17	D.C. Power Supply	Instek	PS-3030	GTS232	June. 28 2017	June. 27 2018
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS588	June. 28 2017	June. 27 2018
19	Universal Radio Communication tester	ROHDE&SCHWARZ	CMU 200	GTS538	June. 28 2017	June. 27 2018
20	Splitter	Agilent	11636B	GTS237	June. 28 2017	June. 27 2018
21	Signal Generator	Rohde & Schwarz	SML03	GTS236	June. 28 2017	June. 27 2018

7 Radio Technical Requirements Specification in ETSI EN 301 908-1/-13

7.1 Radiated emissions

Test Requirement:	ETSI EN 301 908-1 clause 4.2.2		
Test Method:	ETSI EN 301 908-1 clause 5.3.1		
Receiver setup:	Below 1GHz :RBW=100KHz, VBW=30KHz, Detector= peak Above 1GHz :RBW=1MHz, VBW=3MHz,Detector=Peak		
Limit:	Frequency	Limit	
		Traffic mode	Idle mode
	30MHz to 1000 MHz	-36dBm	-57dBm
1GHz to 12.75GHz	-30dBm	-47dBm	
Test mode:	Kept UE in Traffic/Idle mode		
Test Instruments:	See section 6.0		
Test Frequency range:	30MHz to 12.75GHz		
Test setup:	Below 1GHz		
Test setup:	Above 1GHz		
Test procedure:	Substitution method was performed to determine the actual ERP emission		

	<p>levels of the EUT. The following test procedure as below: 1>.Below 1GHz test procedure:</p> <ol style="list-style-type: none"> 1. On the test site as test setup graph above,the EUT shall be placed at the 1.5m support on the turntable and in the position closest to normal use as declared by the provider. 2. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter.The output of the test antenna shall be connected to the measuring receiver. 3. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test. 4. The test antenna shall be raised and lowered from 1m to 4m until a maximum signal level is detected by the measuring receiver. Then the turntable should be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver. 5. Repeat step 4 for test frequency with the test antenna polarized horizontally. 6. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground. 7. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends vertically polarized, and with the signal generator tuned to a particular test frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output. 8. Repeat step 7 with both antennas horizontally polarized for each test frequency. 9. Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps 7 and 8 by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula: $ERP(dBm) = Pg(dBm) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$ where: Pg is the generator output power into the substitution antenna. <p>2>.Above 1GHz test procedure: Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber, and the test antenna do not need to raise from 1 to 4m, just test in 1.5m height.</p>
Measurement Record:	Uncertainty: ± 6dB

Measurement Data:

2. All of the bandwidth mode were tested, only the worst data is reported.

Band 1 (Traffic mode, 5MHz)

Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
161.87	Vertical	-63.91	-36 dBm below 1GHz, -30 dBm above 1GHz.	Pass
435.91	V	-69.04		
3900.00	V	-40.93		
5850.00	V	-40.03		
7800.00	V	-41.63		
73.94	Horizontal	-65.42		
648.02	H	-68.01		
3900.00	H	-39.56		
5850.00	H	-40.85		
7800.00	H	-40.14		

Band 1 (Idle mode, 5MHz)

Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
57.42	Vertical	-67.76	-57 dBm below 1GHz, -47 dBm above 1GHz.	Pass
689.37	V	-72.10		
3900.00	V	-56.28		
5850.00	V	-59.17		
7800.00	V	-56.06		
49.53	Horizontal	-51.65		
752.14	H	-53.03		
3900.00	H	-68.98		
5850.00	H	-73.21		
7800.00	H	-57.60		

Band 3 (Traffic mode, 5MHz)

Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
189.43	Vertical	-67.48	-36 dBm below 1GHz, -30 dBm above 1GHz.	Pass
539.90	V	-70.79		
3494.00	V	-41.52		
6988.00	V	-44.22		
10482.00	V	-41.30		
179.99	Horizontal	-57.82		
553.93	H	-70.06		
3494.00	H	-48.24		
6988.00	H	-45.42		
10482.00	H	-41.05		

Band 3 (Idle mode, 5MHz)

Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
125.53	Vertical	-67.19	-57 dBm below 1GHz, -47 dBm above 1GHz.	Pass
685.42	V	-71.57		
3494.00	V	-55.81		
6988.00	V	-58.75		
10482.00	V	-55.73		
59.55	Horizontal	-51.40		
689.74	H	-52.72		
3494.00	H	-68.44		
6988.00	H	-72.73		
10482.00	H	-57.18		

Band 7 (Traffic mode, 5MHz)

Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
173.05	Vertical	-64.88	-36 dBm below 1GHz, -30 dBm above 1GHz.	Pass
421.60	V	-67.78		
5070.00	V	-40.80		
7605.00	V	-41.73		
10140.00	V	-41.11		
77.91	Horizontal	-55.04		
627.82	H	-67.55		
5070.00	H	-40.41		
7605.00	H	-40.94		
10140.00	H	-39.76		

Band 7 (Idle mode, 5MHz)

Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
86.94	Vertical	-65.05	-57 dBm below 1GHz, -47 dBm above 1GHz.	Pass
857.41	V	-69.58		
5070.00	V	-54.02		
7605.00	V	-57.19		
10140.00	V	-54.49		
79.53	Horizontal	-50.44		
698.47	H	-51.55		
5070.00	H	-66.41		
7605.00	H	-70.92		
10140.00	H	-55.62		

Band 20 (Traffic mode, 5MHz)

Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
131.82	Vertical	-67.25	-36 dBm below 1GHz, -30 dBm above 1GHz.	Pass
539.90	V	-70.60		
1694.00	V	-41.32		
3388.00	V	-43.96		
5082.00	V	-41.02		
126.21	Horizontal	-57.63		
553.93	H	-69.82		
1694.00	H	-48.01		
3388.00	H	-45.22		
5082.00	H	-40.80		

Band 20 (Idle mode, 5MHz)

Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
76.95	Vertical	-66.70	-57 dBm below 1GHz, -47 dBm above 1GHz.	Pass
682.48	V	-71.12		
3800.00	V	-55.40		
5700.00	V	-58.40		
7600.00	V	-55.45		
135.68	Horizontal	-51.18		
724.17	H	-52.45		
3800.00	H	-67.98		
5700.00	H	-72.32		
7600.00	H	-56.83		

7.2 Control and monitoring functions

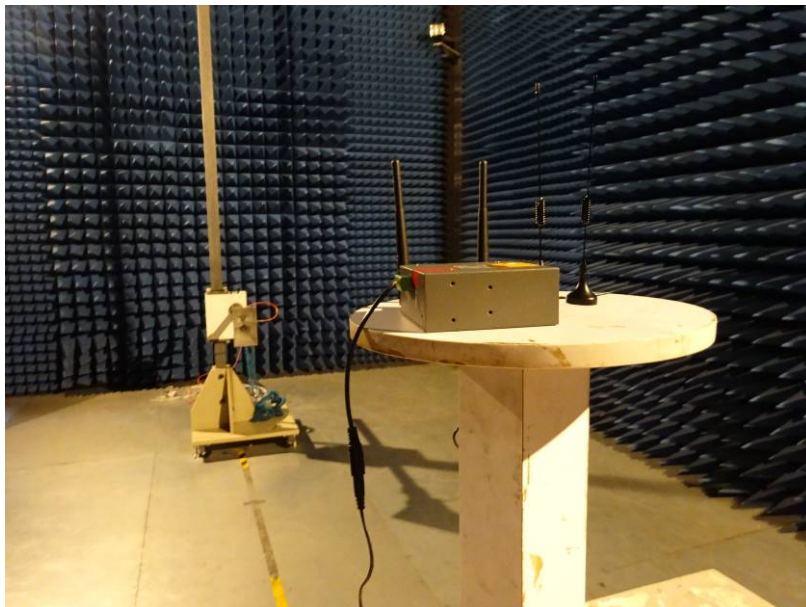
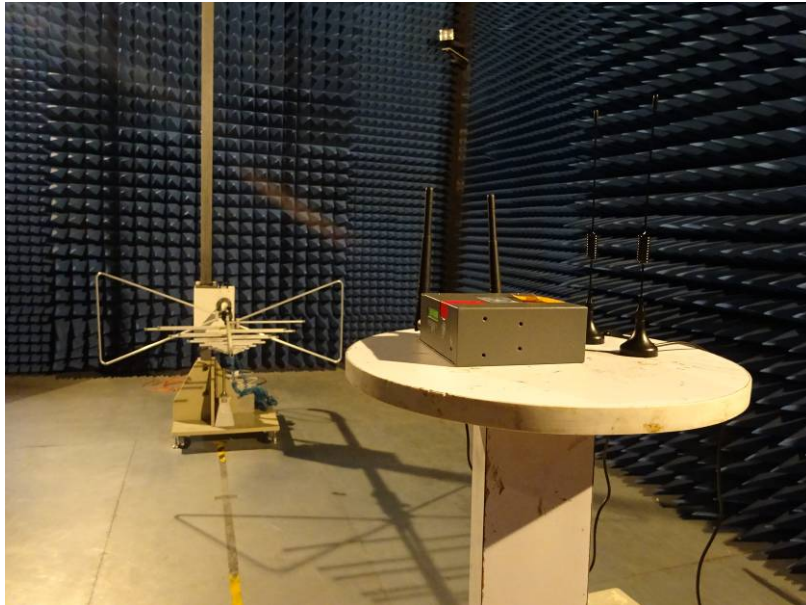
Test Requirement:	ETSI EN 301 908-1 clause 4.2.4
Test Method:	ETSI EN 301 908-13 clause 5.3.3
Limit:	The maximum measured power during the duration of the test shall not exceed -30 dBm.
Test procedure:	<ol style="list-style-type: none">1. At the start of the test, the UE shall be switched off. The UE antenna connector shall be connected to a power measuring equipment, with the following characteristics: - the RF bandwidth shall exceed the total operating transmit frequency range of the UE for operation with an applicable part; - the response time of the power measuring equipment shall be such that the measured power has reached within 1 dB of its steady state value within 100 μs of a CW signal being applied; - it shall record the maximum power measured.2. The UE shall be switched on for a period of approximately fifteen minutes, and then switched off.3. The EUT shall remain switched off for a period of at least thirty seconds, and shall then be switched on for a period of approximately one minute.4. The maximum power emitted from the UE throughout the duration of the test shall be recorded.
Test Instruments:	Refer to section 6.0

Measurement Data:

Note: SIM 1 and SIM 2 is a chipset unit and tested as single chipset.

LTE Band 1				
Test Condition	Observed Frequency Range (MHz)	Maximum Measured Power (dBm)	Limit (dBm)	Result
Normal	1920 ~ 1980	-51.42	-30	Pass
LTE Band 3				
Test Condition	Observed Frequency Range (MHz)	Maximum Measured Power (dBm)	Limit (dBm)	Result
Normal	1710 ~ 1785	-50.47	-30	Pass
LTE Band 7				
Test Condition	Observed Frequency Range (MHz)	Maximum Measured Power (dBm)	Limit (dBm)	Result
Normal	2500~ 2570	-51.33	-30	Pass
LTE Band 8				
Test Condition	Observed Frequency Range (MHz)	Maximum Measured Power (dBm)	Limit (dBm)	Result
Normal	880~915	-50.49	-30	Pass
LTE Band 20				
Test Condition	Observed Frequency Range (MHz)	Maximum Measured Power (dBm)	Limit (dBm)	Result
Normal	832 ~ 862	-51.30	-30	Pass

8 Test Setup Photo



9 EUT Constructional Details

Reference to the test report No. GTS201706000291E01

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