



TEST REPORT

No. I19D00119-SRD04

For

Client: Inseego Corp.

**Production: Industrial Cellular Gateway with Ethernet,WiFi,
Bluetooth,GPS/GLNSS and USB Connectivity**

Model Name: SKG1EM7455

Brand Name: SKYUS 160NE

FCC ID : PKRISGSKG1EM7455

IC ID : 3229A-SKG1EM7455

Hardware Version: P2

Software Version: 2.110.1.2

Issued date: 2019-11-07

NOTE

1. The test results in this test report relate only to the devices specified in this report.
2. This report shall not be reproduced except in full without the written approval of China Telecommunication Technology Labs.
3. KDB 971168 D01 has not been accredited by A2LA.
4. For the test results, the uncertainty of measurement is not taken into account when judging the compliance with specification, and the results of measurement or the average value of measurement results are taken as the criterion of the compliance with specification directly.

Test Laboratory:

East China Institute of Telecommunications

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Revision Version

Report Number	Revision	Date	Memo
I19D00119-SRD04	00	2019-08-30	Initial creation of test report
I19D00119-SRD04	01	2019-11-07	Second creation of test report

CONTENTS

1. TEST LABORATORY	5
1.1. TESTING LOCATION	5
1.2. TESTING ENVIRONMENT	5
1.3. PROJECT DATA	5
1.4. SIGNATURE.....	5
2. CLIENT INFORMATION.....	6
2.1. APPLICANT INFORMATION	6
2.2. MANUFACTURER INFORMATION	6
3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE).....	7
3.1. ABOUT EUT	7
3.2. INTERNAL IDENTIFICATION OF EUT USED DURING THE TEST.....	7
3.3. INTERNAL IDENTIFICATION OF AE USED DURING THE TEST	7
4. REFERENCE DOCUMENTS.....	8
4.1. DOCUMENTS SUPPLIED BY APPLICANT	8
4.2. REFERENCE DOCUMENTS FOR TESTING	8
5. TEST RESULTS	9
5.1. SUMMARY OF TEST RESULTS.....	9
5.2. STATEMENTS.....	9
6. TEST EQUIPMENTS UTILIZED.....	10
6.1. RADIATED EMISSION TEST SYSTEM.....	10
7. MEASUREMENT UNCERTAINTY	11
8. TEST ENVIRONMENT	12
ANNEX A.1. RADIATED	13
ANNEX A. ACCREDITATION CERTIFICATE	20

1. Test Laboratory

1.1. Testing Location

Company Name	East China Institute of Telecommunications
Address	7-8/F., Area G, No.668, Beijing East Road, Shanghai, China
Postal Code	200001
Telephone	+86 21 63843300
Fax	+86 21 63843301
FCC registration No	CN1177
IC registration No	10766A-1

1.2. Testing Environment

Normal Temperature	15°C-35°C
Relative Humidity	20%-75%

1.3. Project Data

Project Leader	Chen Minfei
Testing Start Date	2019-07-21
Testing End Date	2019-07-24

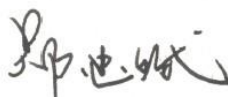
1.4. Signature



Wang Liang
(Prepared this test report)



Fan Songyan
(Reviewed this test report)



Zheng Zhongbin
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name	Inseego Corp.
Address	9605 Scranton Road, Suite 300, San Diego, CA 92121, USA
Telephone	+1 858-812-0606
Postcode	/

2.2. Manufacturer Information

Company Name	Sierra Wireless Inc.
Address	13811, Wireless Way, Richmond, British Columbia Canada
Telephone	+1 604 232 1440
Postcode	/

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Production	Industrial Cellular Gateway with Ethernet,WiFi, Bluetooth,GPS/GLNSS and USB Connectivity
Model name	SKG1EM7455
UMTS Frequency Band	I/II/III/IV/V/VIII
LTE Frequency Band	1/2/3/4/5/7/12/13/20/25/26/29/30/41
Extreme Temperature	-30/+60℃
Nominal Voltage	12V
Extreme High Voltage	32V
Extreme Low Voltage	9V

Note:

- Photographs of EUT are shown in ANNEX A of this test report.
- The value of the antenna gain is provided by the customer. For specific antenna information, please check the antenna specifications of the customer.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
N04	/	2.110.1.2	P2	2019-07-20
N16	/	2.110.1.2	P2	2019-07-20

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	Type	Manufacturer
AE1	RF cable	---	AE1

*AE ID: is used to identify the test sample in the lab internally.

4. Reference Documents

4.1. Documents supplied by applicant

All technical documents are supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	2018-10-01
FCC Part 22	PUBLIC MOBILE SERVICES	2018-10-01
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	2018-10-01
ANSI-TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI C63.26	American National Standard of Procedures for Compliance Testing of Licensed Transmitters Used in Licensed Radio	2015
KDB 971168 D01	Measurement Guidance for Certification of Licensed Digital Transmitters	v03r01
RSS-Gen	RSS-Gen —General Requirements for Compliance of Radio Apparatus	2019-03
RSS-132	Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz	2013-10
RSS-133	2 GHz Personal Communications Services	2018-01

5. Test Results

5.1. Summary of Test Results

Measurement Items	Sub-clause of Part15C	Sub-clause of IC	Verdict
Emission Limit	2.1051/22.917/24.238/2 2.913/24.232	RSS-132 5.5/ RSS-133 6.5	P

Note: please refer to Annex A in this test report for the detailed test results.

The following terms are used in the above table.

P	Pass, the EUT complies with the essential requirements in the standard.
NP	Not Perform, the test was not performed by ECIT.
NA	Not Applicable, the test was not applicable.
F	Fail, the EUT does not comply with the essential requirements in the standard.

5.2. Statements

The SKG1EM7455 is a new product for testing.

In this report, we only retest and report the radiation test data. And the conduct test results please refer to report No:B15W50341-FCC-RF-REV1, which was prepared by China Telecommunication Technology Labs.

ECIT only performed test cases which identified with Pass/Fail/N/A/Inc/Decl/BR results in Annex C.

ECIT has verified that the compliance of the tested device specified in section 3 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 4 of this test report.

6. Test Equipments Utilized

6.1. Radiated Emission Test System

The test equipment and ancillaries used are as follows.

No.	Equipment	Model	SN	Manufacture	Cal.date	Cal.interval
1	Universal Radio Communication Tester	CMU200	123123	R&S	2019-05-10	1 year
2	EMI Test Receiver	ESU40	100307	R&S	2019-05-10	1 year
3	TRILOG Broadband Antenna	VULB9163	VULB9163-515	Schwarzbeck	2017-02-25	3 years
4	Double-ridged Waveguide Antenna	ETS-3117	00135890	ETS	2017-01-11	3 years
5	2-Line V-Network	ENV216	101380	R&S	2019-05-10	1 year
6	Substitution Antenna	ETS-3117	00135890	ETS	2017-01-11	3 years
7	RF Signal Generator	SMF100A	102314	R&S	2019-05-10	1 year
8	Substitution Antenna	VUBA9117	9117-266	Schwarzbeck	2017-11-18	3 years
9	Amplifier	SCU08	10146	R&S	2019-05-10	1 year

7. Measurement Uncertainty

Measurement uncertainty for all the testing in this report are within the limit specified in ECIT documents .
The detailed measurement uncertainty is defined in ECIT documents.

Measurement Items	Range	Confidence Level	Calculated Uncertainty
Maximum Peak Output Power	30MHz-3600MHz	95%	$\pm 0.544\text{dB}$
EBW and VBW	30MHz-3600MHz	95%	$\pm 62.04\text{Hz}$
Transmitter Spurious Emission-Conducted	30MHz-2GHz	95%	$\pm 0.90\text{dB}$
Transmitter Spurious Emission-Conducted	2GHz-3.6GHz	95%	$\pm 0.88\text{dB}$
Transmitter Spurious Emission-Conducted	3.6GHz-8GHz	95%	$\pm 0.96\text{dB}$
Transmitter Spurious Emission-Conducted	8GHz-20GHz	95%	$\pm 0.94\text{dB}$
Transmitter Spurious Emission-Radiated	9KHz-30MHz	95%	$\pm 5.66\text{dB}$
Transmitter Spurious Emission-Radiated	30MHz-1000MHz	95%	$\pm 4.98\text{dB}$
Transmitter Spurious Emission-Radiated	1000MHz -18000MHz	95%	$\pm 5.06\text{dB}$
Transmitter Spurious Emission-Radiated	18000MHz -40000MHz	95%	$\pm 5.20\text{dB}$
Frequency stability	1MHz-16GHz	95%	$\pm 62.04\text{Hz}$

8. Test Environment

Shielding Room1 (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Ground system resistance	< 0.5 Ω

Control room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. =25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber1 (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB,30MHz to 1GHz
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

ANNEX A.1. RADIATED

A.1.1. EIRP

A.1.1.2. WCDMA EIRP

A.1.1.2.1. Description

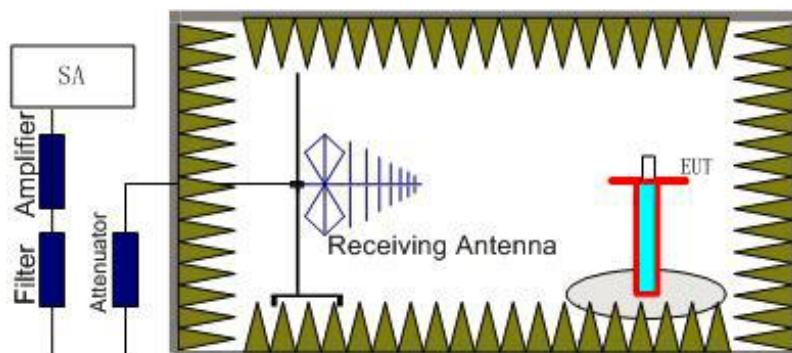
This is the test for the maximum radiated power from the EUT.

Rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. "Rule Part 22.913(a) specifies " The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

A.1.1.2.2. Method of Measurement

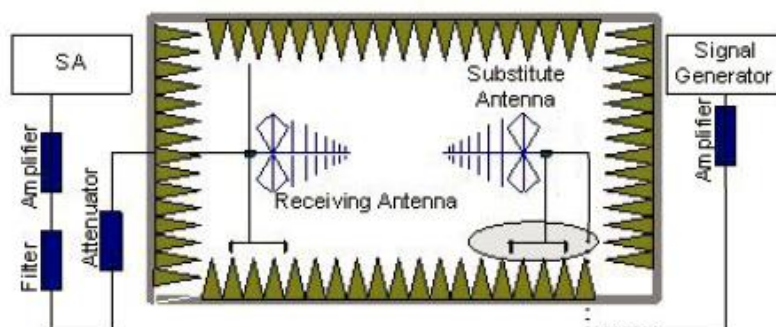
The measurements procedures in TIA-603E-2016 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (P_r).

3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the

receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna.

The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.

A.1.1.2.3 WCDMA Band II-ERP Limits

Band	Burst Peak EIRP (dBm)
WCDMA Band II	$\leq 33\text{dBm}$ (2W)

A.1.1.2.3.1 Measurement result

Frequency (MHz)	PeakEIRP(dBm)	Polarization
1852.4	24.64	V
1880.0	24.15	H
1907.6	23.27	V

Frequency: 1852.4MHz

ANALYZER SETTINGS: RBW = VBW = 5MHz

A.1.1.2.4 WCDMA Band IV-ERP Limits

Band	Burst Peak EIRP (dBm)
WCDMA Band IV	$\leq 33\text{dBm}$ (2W)

A.1.1.2.4.1 Measurement result

Frequency (MHz)	PeakEIRP(dBm)	Polarization
1712.4	24.54	H
1732.6	24.34	H
1752.6	24.71	H

Frequency: 1752.6 MHz

ANALYZER SETTINGS: RBW = VBW = 5MHz

A.1.1.2.5 WCDMA Band V-ERP Limits

Band	Burst Peak ERP (dBm)
WCDMA Band V	≤38.45dBm (7W)

A.1.1.2.5.1 Measurement result

Frequency (MHz)	PeakEIRP(dBm)	Polarization
826.4	24.20	H
836.6	23.88	H
846.6	23.87	H

Frequency: 826.4MHz**ANALYZER SETTINGS: RBW = VBW = 5MHz****Note: the EUT was displayed in several different direction, the worst cases were shown.**

A.1.3 WCDMA Measurement Method

The measurements procedures in TIA-603E-2016 are used.

The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set as outlined in Part 24.238 and Part 24.917.

The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of WCDMA Band V.

The procedure of radiated spurious emissions is the same like GSM.

A.1.3.1 Measurement Limit

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A.1.3.2 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the WCDMA Band V (826.4MHz, 836.6MHz and 846.6MHz) . It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the WCDMA Band V into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

A.1.3.3 Measurement Results Table

Frequency	Channel	Frequency Range	Result
WCDMA Band II	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P
WCDMA Band IV	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P
WCDMA Band V	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P

WCDMA BAND II Mode Channel 4132
Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3701.6	-59.93	6.6	7.7	-58.83	-13	H
5550.8	-60.43	8.2	9.5	-59.13	-13	H
7457.6	-61.94	9.7	14.6	-57.04	-13	V
9229.2	-62	10.6	18.5	-54.1	-13	V
10872.4	-57.53	11.8	17.3	-52.03	-13	V
12563.1	-55.17	12.8	18.7	-49.27	-13	V

WCDMA BAND II Mode Channel 4183
Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3761.6	-62.02	6.6	7.7	-60.92	-13	V
5534.4	-59.28	8.2	9.5	-57.98	-13	V
7528.8	-62.17	9.7	14.6	-57.27	-13	H
9568.0	-61.8	10.8	18.6	-54	-13	H
10846.4	-56.82	11.7	17.3	-51.22	-13	H
11983.2	-54.5	12.6	17.1	-50	-13	H

WCDMA BAND II Mode Channel 4233
Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3841.2	-61.03	6.7	7.7	-60.03	-13	V
4586.0	-58.08	7.4	7.3	-58.18	-13	H
5715.6	-60.91	8.5	10.5	-58.91	-13	V
7617.6	-60.99	9.7	14.6	-56.09	-13	V
9382.0	-60.41	10.7	18.6	-52.51	-13	V
10877.2	-58.7	11.8	18.1	-52.4	-13	V

WCDMA BAND IV Mode Channel 1312
Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3423.2	-59.3	6.3	4.7	-60.9	-13	V
5146.4	-61.46	7.9	8.7	-60.66	-13	V
6828.4	-61.44	9.2	12.3	-58.34	-13	H
8561.2	-64.26	10.3	18.1	-56.46	-13	V
10204.0	-58.29	11.3	17.4	-52.19	-13	H
11967.8	-56.04	12.6	17.1	-51.54	-13	H

WCDMA BAND IV Mode Channel 1413
Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3463.2	-61.07	6.4	4.7	-62.77	-13	V
5150.8	-61.22	7.9	8.7	-60.42	-13	V
6928.4	-61.61	9.3	12.9	-58.01	-13	H
8662.4	-63.62	10.3	18.5	-55.42	-13	V
10359.2	-59.31	11.6	17.4	-53.51	-13	H
12123.2	-55.58	12.6	17.1	-51.08	-13	H

WCDMA BAND IV Mode Channel 1513
Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3508.4	-62.57	6.4	4.7	-64.27	-13	H
5262.4	-60.39	8.0	8.7	-59.69	-13	V
7086.8	-60.39	9.4	12.9	-56.89	-13	V
8651.2	-62.83	10.3	18.5	-54.63	-13	V
10548.4	-58.87	11.6	17.1	-53.37	-13	V
12285.6	-55.37	12.7	17.5	-50.57	-13	H

WCDMA BAND V Mode Channel 4132
Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1653.2	-57.87	4.3	2.9	-59.27	-13	H
2479.6	-51.06	5.3	3.7	-52.66	-13	H
3326.0	-62.57	6.2	4.7	-64.07	-13	H
4178.0	-61.72	7.0	7.7	-61.02	-13	H
4984.0	-63.24	7.8	9.0	-62.04	-13	H
5795.6	-60.79	8.4	10.5	-58.69	-13	H

WCDMA BAND V Mode Channel 4183
Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1678.2	-57.59	4.4	2.9	-59.09	-13	H
2508.8	-51.54	5.4	3.7	-53.24	-13	H
3366.0	-62.53	6.2	4.7	-64.03	-13	H
4173.6	-61.94	7.0	7.7	-61.24	-13	H
5032.4	-63.36	7.8	9.0	-62.16	-13	V
5834.0	-60.72	8.4	10.5	-58.62	-13	V

WCDMA BAND V Mode Channel 4233
Final result:

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1699.3	-57.66	4.4	2.9	-59.16	-13	V
2530.8	-50.7	5.4	3.7	-52.4	-13	V
3382.4	-62.78	6.3	4.7	-64.38	-13	V
4229.6	-61.22	7.1	7.7	-60.62	-13	V
5075.2	-64.21	7.9	9.0	-63.11	-13	V
5928.0	-60.52	8.5	10.4	-58.62	-13	H

Conclusion: PASS
Note: the EUT was displayed in several different direction, the worst cases were shown.

ANNEX A. Accreditation Certificate



*****END OF REPORT*****