



FCC RADIO TEST REPORT

FCC ID	:	PKRISGM3000B
Equipment	:	M3000B
Brand Name	:	Inseego
Model Name	:	M3000B
Marketing Name	:	M3000
Applicant	:	Inseego Corp. 9710 Scranton Road Suite 200, San Diego,, CA 92121
Manufacturer	:	Inseego Corp. 9710 Scranton Road Suite 200, San Diego,, CA 92121
Standard	:	FCC 47 CFR Part 2, 96

The product was received on Sep. 29, 2022 and testing was performed from Oct. 02, 2022 to Oct. 03, 2022. We, Sporton International (USA) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval from Sporton International (USA) Inc., the test report shall not be reproduced except in full.

Mil Kao

Approved by: Neil Kao

Sporton International (USA) Inc.

1175 Montague Expressway, Milpitas, CA 95035



Table of Contents

His	story	of this test report	3
Su	mmar	ry of Test Result	4
1	Gen	eral Description	5
	1.1 1.2 1.3 1.4	Product Feature of Equipment Under Test Modification of EUT Testing Location Applied Standards	5 5 5 6
2	Test	Configuration of Equipment Under Test	7
	2.1 2.2 2.3	Test Mode Measurement Results Explanation Example Frequency List of Low/Middle/High Channels	
3	Con	ducted Test Items	9
	3.1 3.2 3.3 3.4 3.5 3.6	Measuring Instruments Conducted Output Power EIRP Occupied Bandwidth Conducted Band Edge Conducted Spurious Emission	
4	List	of Measuring Equipment	
Ар	pendi	ix A. Test Results of Conducted Test	



History of this test report

FG211223001B 01 Initial issue of report Image: Second	Oct. 06, 2022



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.2	§2.1046	Conducted Output Power	Reporting only	-
3.3	§96.41	Effective Isotropic Radiated Power	Pass	-
3.4	§2.1049 §96.41	Occupied Bandwidth	Reporting only	-
3.5	§2.1051 §96.41	Conducted Band Edge Measurement	Pass	-
3.6	§2.1051 §96.41	\$2.1051 \$96.41 Conducted Spurious Emission		-

Conformity Assessment Condition:

The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.

Comments and Explanations:

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.



1 General Description

1.1 Product Feature of Equipment Under Test

3G-WCDMA, 4G-LTE, 5G-FR1, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, and GNSS

Product Feature					
	WWAN: Internal Antenna				
	WLAN				
Antenna Type	<ant. 0="">: Internal Antenna</ant.>				
	<ant. 1="">: Internal Antenna</ant.>				
	GPS / Glonass / BDS / Galileo : Internal Antenna				
	5G NR n48				
Antenna Gain	<ant. 4="">:</ant.> 1.5 dBi				
	<ant. 6="">:</ant.> 3.8 dBi				

Remark: The EUT's information above was declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Test Site	Sporton International (USA) Inc.						
Test Site Location1175 Montague Expressway, Milpitas, CA 95035 TEL : 408 9043300							
Toot Site No	Sporton Site No.						
lest Site No.	TH01-CA						
Test Engineer	Venkata Kondepudi						
Temperature	22~24°C						
Relative Humidity	48.7~52.2%						

FCC Designation No.: US1250



1.4 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26-2015
- ANSI / TIA-603-E
- FCC 47 CFR Part 2, 96
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 940660 D01 Part 96 CBRS Eqpt v03
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.



2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Tank Kama	Dend	Bandwidth (MHz)				Modulation				RB #			Test Channel			
lest items	Band	10	20	30	40	PI/2 BPSK	QPSK	16QAM	64QAM	256QAM	1	Half	Full	L	м	н
Max. Output Power	n48			v	v	v	v	v	v	v	×	v	v	v	×	v
26dB and 99% Bandwidth	n48			v	v	v	v	v	v	v			v		×	
Conducted Band Edge	n48			v	v	v	v	v	v	v	×		v	v	×	v
Conducted Spurious Emission	n48			v	v		v				v			v	v	v
E.I.R.P	n48			v	v	v	v	v	v	v	Max. Power					
Remark	 The mark "v " means that this configuration is chosen for testing The mark "-" means that this bandwidth is not supported. This test report merely covers conducted test for bandwidths 30MHz and 40MHz, while the rest of the bandwidths supported and missing test items are covered by another report issued by Sporton International Inc, report No. FG1D2409G. 															

2.2 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

Example :

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)



2.3 Frequency List of Low/Middle/High Channels

5G NR n48 Channel and Frequency List									
BW [MHz]	BW [MHz] Channel/Frequency(MHz) Lowest Middle Highes								
40	Channel	638000	641666	645332					
	Frequency	3570	3624.99	3679.98					
30	Channel	637668	641666	645666					
	Frequency	3565.02	3624.99	3684.99					

TEL : 408 9043300	Page Number	: 8 of 15
Report Template No.: BU5-FGLTE96 Version 2.4	Issue Date	: Oct. 06, 2022
	Report Version	: 01



3 Conducted Test Items

3.1 Measuring Instruments

See list of measuring instruments of this test report.

3.1.1 Test Setup

3.1.2 Conducted Output Power



3.1.3 Occupied Bandwidth, Conducted Band Edge and Conducted Spurious Emission



3.1.4 Test Result of Conducted Test

Please refer to Appendix A.



3.2 Conducted Output Power

3.2.1 Description of the Conducted Output Power Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

3.2.2 Test Procedures

- 1. The transmitter output port was connected to the system simulator.
- 2. Set EUT at maximum power through the system simulator.
- 3. Select lowest, middle, and highest channels for each band and different modulation.
- 4. Measure and record the power level from the system simulator.



3.3 EIRP

3.3.1 Description of the EIRP Measurement

The EIRP of mobile transmitters must not exceed 23 dBm /10 megahertz for 5G NR n48.

The testing follows ANSI C63.26-2015 Section 5.2.5.5

According to KDB 412172 D01 Power Approach,

EIRP = PT + GT - LC, where

PT = transmitter output power in dBm

GT = gain of the transmitting antenna in dBi

LC = signal attenuation in the connecting cable between the transmitter and antenna in dB

Device	Maximum EIRP	Maximum PSD		
	(aBm/10 WHZ)	(abm/whz)		
End User Device	23	n/a		

Remark:

- 1. Total channel power is complied with EIRP limit 23dBm/10MHz.
- 2. The MIMO mode is completely uncorrelated, so the directional gain is selected the maximum gain among all antennas.

3.3.2 Test Procedures

The testing follows procedure in Section 5.2 of ANSI C63.26-2015 and KDB 940660 D01 Part 96 CBRS Eqpt v03 Section 3.2(b)(2)

Determine the EIRP by adding the effective antenna gain to the measured average conducted power level.

TEL : 408 9043300	Page Number	: 11 of 15
Report Template No.: BU5-FGLTE96 Version 2.4	Issue Date	: Oct. 06, 2022
	Report Version	: 01



3.4 Occupied Bandwidth

3.4.1 Description of Occupied Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

3.4.2 Test Procedures

The testing follows ANSI C63.26-2015 Section 5.4.3 (26dB) and Section 5.4.4 (99OB)

- 1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
- The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
- 3. The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
- 4. Set the detection mode to peak, and the trace mode to max hold.
- Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace. (this is the reference value)
- 6. Determine the "-26 dB down amplitude" as equal to (Reference Value X).
- 7. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the "-X dB down amplitude" determined in step 6. If a marker is below this "-X dB down amplitude" value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
- 8. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.



3.5 Conducted Band Edge

3.5.1 Description of Conducted Band Edge Measurement

The conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed -25 dBm/MHz. Notwithstanding the emission limits in this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.

3.5.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 6.1.

- 1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
- 2. The band edges of low and high channels for the highest RF powers were measured.
- 3. Set RBW >= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.
- 4. Beyond the 1 MHz band from the band edge, RBW=1MHz was used
- 5. Set spectrum analyzer with RMS detector.
- 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
- 7. For MIMO mode, add additional MIMO factor 10log(NTX=2) = 3.01dB into the spectrum analyzer offset.

For Adjacent Channel Leakage Ratio (ACLR) measurement,

- 1. The Adjacent Channel Leakage Ratio (ACLR) is the ratio of the average power in the assigned aggregated channel bandwidth to the average power over the equivalent adjacent channel bandwidth.
- 2. The option ACLR of spectrum analyzer is used and measures the ACLR ratio by setting equivalent channel bandwidth.
- 3. The measured ACLR ratio shall be at least 30 dB.

3.6 Conducted Spurious Emission

3.6.1 Description of Conducted Spurious Emission Measurement

96.41 (e)(2)

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz.

3.6.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 6.1.

- 1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
- The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. The middle channel for the highest RF power within the transmitting frequency was measured.
- 4. The conducted spurious emission for the whole frequency range was taken.
- 5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
- 6. Set spectrum analyzer with RMS detector.
- 7. Taking the record of maximum spurious emission.
- 8. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
- 9. The limit line is -40dBm/MHz.
- 10. For MIMO mode, add additional MIMO factor 10log(NTX=2) = 3.01dB into the spectrum analyzer offset.



4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	Testo	608-H1	45141354	N/A	Jul. 27, 2022	Oct. 02, 2022~ Oct. 03, 2022	Jul. 26, 2023	Conducted (TH01-CA)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101545	10Hz-40GHz	May 31, 2022	Oct. 02, 2022~ Oct. 03, 2022	May 30, 2023	Conducted (TH01-CA)
Radio Communicatio n Test Station	Anritsu	MT8000A	6262208375	N/A	Jun. 08, 2022	Oct. 02, 2022~ Oct. 03, 2022	Jun. 07, 2023	Conducted (TH01-CA)



Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power) and EIRP <SISO Mode>

		NR n48 M	aximum Aver	age Powe	r [dBm] (G	T - LC = 1.	5 dB)		
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)	
30	1	1		13.80	18.74	15.35			
30	1	76		13.55	18.72	15.49			
30	36	18	PI/2 BPSK	13.67	18.81	15.63			
30	1	0		13.75	18.31	15.45			
30	1	77		13.65	18.24	15.57		0.1074	
30	75	0		13.75	18.31	15.61	20.31		
30	1	1		13.69	18.75	15.42			
30	1	76		13.56	18.70	15.46			
30	36	18	OPSK	13.71	18.78	15.58			
30	1	0	QFSK	13.71	17.85	15.42			
30	1	77		13.69	17.75	15.49			
30	75	0		13.75	17.75	15.59			
30	1	1	16-QAM	13.57	17.80	15.23			
30	1	1	64-QAM	14.61	16.26	15.12	19.30	0.0851	
30	1	1	256-QAM	14.49	14.05	15.11			
Limit	EIR	<pre>> < 23dBm/</pre>	10MHz		Result		Pass		

	NR n48 Maximum Average Power [dBm] (GT - LC = 1.5 dB)												
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)					
40	1	1		14.56	18.72	14.50							
40	1	104		14.63	18.69	14.49							
40	50	25		14.64	18.77	14.54							
40	1	0	FIZ DF3N	14.61	18.15	14.46							
40	1	105		14.69	18.25	14.50		0.1074					
40	100	0		14.66	18.18	14.54	20.21						
40	1	1	-	13.78	18.66	15.45	20.31						
40	1	104		13.75	18.81	15.50							
40	50	25	OBSK	13.66	18.77	15.53							
40	1	0	QFSK	13.62	17.68	15.50							
40	1	105		13.79	17.75	15.49							
40	100	0		13.75	17.74	15.56							
40	1	1	16-QAM	13.94	17.63	14.58							
40	1	1	64-QAM	14.62	16.00	14.45	19.13	0.0818					
40	1	1	256-QAM	14.28	14.01	14.18							
Limit	EIR	< 23dBm/	10MHz		Result		Pass						

Total EIRP power is less than partial EIRP limit 23 dBm/10MHz.



<MIMO Mode>

	Part96 NR n48 Maximum Average Power [dBm], DG = 3.8 dBi													
BW	RB	RB	Mod	Antenna 4			Antenna 6			Combine			EIRP	EIRP
(MHz)	Size	Offset	Widd	Lowest	Middle	Highest	Lowest	Middle	Highest	Lowest	Middle	Highest	(dBm)	(W)
30	1	1		8.86	12.88	11.38	9.69	13.28	11.75	12.31	16.09	14.58		
30	1	76	QPSK	9.13	13.09	11.31	9.53	13.27	11.72	12.34	16.19	14.53		
30	39	19		8.96	12.95	11.39	9.67	13.27	11.76	12.34	16.12	14.59	10.00	0 0008
30	1	0		8.80	11.38	11.49	9.62	11.93	11.94	12.24	14.67	14.73	19.99	0.0990
30	1	77		9.02	11.51	11.34	9.50	11.76	11.71	12.28	14.65	14.54		
30	78	0		8.99	11.45	11.43	9.69	11.76	11.75	12.36	14.62	14.60		
30	1	1	16-QAM	11.11	12.37	11.35	11.57	12.89	11.99	14.36	15.65	14.69		
30	1	1	64-QAM	10.70	10.72	11.52	11.79	11.46	11.57	14.29	14.12	14.56	19.45	0.0881
30	1	1	256-QAM	10.96	7.82	11.50	11.58	8.22	11.91	14.29	11.03	14.72		
Limit EIRP < 23dBm/10MHz							Result					Pa	ISS	

	Part96 NR n48 Maximum Average Power [dBm], DG = 3.8 dBi													
BW	RB	RB	Mod	Antenna 4			Antenna 6			Combine			EIRP	EIRP
(MHz)	Size	Offset	Widd	Lowest	Middle	Highest	Lowest	Middle	Highest	Lowest	Middle	Highest	(dBm)	(W)
40	1	1		10.00	13.00	9.36	10.76	13.15	9.72	13.41	16.09	12.55		
40	1	104	ODSK	10.35	13.24	9.34	10.77	13.27	9.65	13.58	16.27	12.51		
40	53	26		10.70	12.94	9.29	10.06	13.28	9.73	13.40	16.12	12.53	20.07	0 1016
40	1	0	QFSK	10.70	11.47	9.45	9.92	11.66	9.74	13.34	14.58	12.61	20.07	0.1010
40	1	105		10.40	11.26	9.36	11.49	10.80	9.74	13.99	14.05	12.56		
40	106	0		10.71	11.47	9.33	10.09	11.80	9.76	13.42	14.65	12.56		
40	1	1	16-QAM	9.66	12.58	10.31	8.93	12.74	10.80	12.32	15.67	13.57		
40	1	1	64-QAM	9.70	10.76	10.14	10.60	11.20	10.70	13.18	14.00	13.44	19.47	0.0885
40	1	1	256-QAM	10.02	7.80	10.46	10.69	8.25	10.72	13.38	11.04	13.60		
Limit EIRP < 23dBm/10MHz							Result					Pa	ass	

Total EIRP power is less than partial EIRP limit 23 dBm/10MHz.



FR1 n48

<SISO Mode>

<Ant. 4>

26dB Bandwidth

Mode	FR1 n48 : 26dB BW(MHz) / DFT-S OFDM									
BW	30MHz	40MHz								
Mod.	PI/2 BPSK	PI/2 BPSK								
Middle CH	28.05	38.36								

Mode		FR1 n48 : 26dB BW(MHz) / CP OFDM											
BW	30MHz		40MHz										
Mod.	QPSK	16QAM	QPSK	16QAM									
Middle CH	28.83	28.95	40.44	40.44									
Mod.	64QAM	256QAM	64QAM	256QAM									
Middle CH	29.13	29.191	40.36	40.60									











Occupied Bandwidth

Mode		FR1 n48 : OB BW(MHz) / DFT-S OFDM									
BW	30MHz	40MHz									
Mod.	PI/2 BPSK	PI/2 BPSK									
Middle CH	26.79	35.96									

Mode		FR1 n48 : OB BW(MHz) / CP OFDM										
BW	30MHz		40MHz									
Mod.	QPSK	16PSK	QPSK	16QAM								
Middle CH	27.87	27.87	38.04	37.96								
Mod.	64QAM	256QAM	64QAM	256QAM								
Middle CH	27.75	27.81	37.96	37.88								











Unwanted Emission (MASK)









































































