

RF Exposure Evaluation Report

APPLICANT : Inseego Corp.
EQUIPMENT : Outdoor Fixed CPE
BRAND NAME : Inseego
MODEL NAME : FW2010-1, FW2010e-1
FCC ID : PKRISGFW2010
STANDARD : 47 CFR Part 1.1307(b)

The product evaluation date was started from Jul. 07, 2023 and completed on Jul. 07, 2023. We, Sporton International Inc. (Kunshan), would like to declare that the device has been evaluated in accordance with 47 CFR Part 1.1307(b), and pass the limit. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.



Approved by: Si Zhang



Sporton International Inc. (Kunshan)

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA221528	Rev. 01	Initial issue of report.	Jul. 13, 2023



1. Administration Data

1.1. Testing Laboratory

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR01-KS	CN1257	314309

Applicant	
Company Name	Inseego Corp.
Address	9710 Scranton Road, Suite 200 San Diego, CA 92121

Manufacturer	
Company Name	Inseego Corp.
Address	9710 Scranton Road, Suite 200 San Diego, CA 92121



2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Outdoor Fixed CPE
Brand Name	Inseego
Model Name	FW2010-1, FW2010e-1
FCC ID	PKRISGFW2010
Wireless Technology and Frequency Range	LTE Band 2 : 1850 MHz ~ 1910 MHz LTE Band 4 : 1710 MHz ~ 1755 MHz LTE Band 5 : 824 MHz ~ 849 MHz LTE Band 7 : 2500 MHz ~ 2570 MHz LTE Band 12 : 699 MHz ~ 716 MHz LTE Band 13 : 777 MHz ~ 787 MHz LTE Band 14 : 788 MHz ~ 798 MHz LTE Band 17 : 704 MHz ~ 716 MHz LTE Band 25 : 1850 MHz ~ 1915 MHz LTE Band 26 : 814 MHz ~ 849 MHz LTE Band 30 : 2305 MHz ~ 2315 MHz LTE Band 38 : 2570 MHz ~ 2620 MHz LTE Band 41 : 2496 MHz ~ 2690 MHz LTE Band 42 : 3550 MHz ~ 3600 MHz LTE Band 43 : 3600 MHz ~ 3700 MHz LTE Band 48 : 3550 MHz ~ 3700 MHz LTE Band 66 : 1710 MHz ~ 1780 MHz LTE Band 71 : 663 MHz ~ 698 MHz 5G NR n2 : 1850 MHz ~ 1910 MHz 5G NR n5 : 824 MHz ~ 849 MHz 5G NR n12 : 699 MHz ~ 716 MHz 5G NR n25 : 1850 MHz ~ 1915 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n77 : 3700 MHz ~ 3980 MHz 5G NR n260 : 37000 MHz ~ 40000 MHz 5G NR n261 : 27500 MHz ~ 28350 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	LTE: QPSK, 16QAM, 64QAM, 256QAM(Downlink Only) 5G NR FR1: DFT-s-OFDM (PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM) CP-OFDM (QPSK / 16QAM / 64QAM / 256QAM) 5G NR FR2: DFT-s-OFDM (PI/2 BPSK / QPSK / 16QAM / 64QAM) CP-OFDM (QPSK / 16QAM / 64QAM) Bluetooth LE
Antenna Gain	<For WWAN/5G NR FR1> LTE Band 2 : 5.18 dBi LTE Band 4 : 5.18 dBi LTE Band 5 : 3.09 dBi LTE Band 7 : 5.56 dBi LTE Band 12 : 0.81 dBi LTE Band 13 : 2.20 dBi LTE Band 14 : 2.20 dBi LTE Band 17 : 0.97 dBi LTE Band 25 : 5.18 dBi LTE Band 26 : 3.09 dBi LTE Band 30 : 3.56 dBi LTE Band 38 : 3.92 dBi LTE Band 41 : 5.56 dBi LTE Band 42 : 6.43 dBi LTE Band 43 : 6.42 dBi

	LTE Band 48 : 7.45 dBi LTE Band 66 : 5.18 dBi LTE Band 71 : 0.25 dBi n2: 3.00 dBi n5: 5.08 dBi n12: 0.81 dBi n25: 3.00 dBi n41 : 5.56 dBi n66: 5.18 dBi n71 : 0.33 dBi n77 : 7.94 dBi <For Bluetooth> Bluetooth: gain 1.67 dBi
EUT Stage	Production Unit

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. This device supports HPUE for LTE band 41 with class 2 power level, so HPUE has been performed standalone power density calculation.
3. LTE band 42/43 covered by LTE band 48 with the same power level, so only chose LTE band 48 to perform standalone power density calculation.
4. For DFT-s-OFDM and CP-OFDM output power measurement reduction, according to maximum power reduction for the CP-OFDM mode will not higher than DFT-s-OFDM mode, therefore, CP-OFDM measurement is unnecessary. We always chose higher power (DFT-s-OFDM mode) to perform MPE analysis.
5. The intra-band ULCA and EN-DC mode combination could be referred to the product spec.
6. This device supports intra-band ULCA, due to intra-band ULCA and non-CA power is same, so non-CA MPE analysis can represent ULCA MPE analysis.
7. This is a variant report. The difference between current project and previous project is enabled 5G NR n77 by software. According to the difference, added 5G NR n77 evaluation based on original report, and other Bands leverage from original report which can be referred to Sporton Report Number FA0D1611.

Comments and Explanations:

1. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.
2. The maximum RF output tune up power, antenna gain also the safe distance used for evaluate RF exposure were declared by manufacturer.

3. Maximum RF Tune Up power among production units

Conducted Power

<LTE>

Mode		Maximum Average power(dBm)
LTE	Band 2	24.00
	Band 4	24.00
	Band 5	24.00
	Band 7	24.00
	Band 12	24.00
	Band 13	24.00
	Band 14	24.00
	Band 17	24.00
	Band 25	24.00
	Band 26	24.00
	Band 30	24.00
	Band 38	24.00
	Band 41	24.00
	Band 41-HPUE	26.00
	Band 42	19.50
	Band 43	19.50
	Band 48	19.50
	Band66	24.00
	Band71	24.00

<5G NR FR1>

Mode		Maximum Average power(dBm)
5G NR FR1	n2	24.00
	n5	24.00
	n12	24.00
	n25	24.00
	n41	24.00
	n66	24.00
	n71	24.00
	n77	24.00



<Bluetooth>

Mode	Maximum Average Power (dBm)
Bluetooth LE	4.00

EIRP Power

Mode		Maximum Average power(dBm)
5G NR FR2	n260	53.0
	n261	50.2



4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

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

The MPE was calculated at **150 cm** to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna

Note: This device is a fixed outdoor use device.



5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 150cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
LTE Band 2	1850.7	5.18	24.00	29.180	0.828	827.942	0.003	1.000	0.003
LTE Band 4	1710.7	5.18	24.00	29.180	0.828	827.942	0.003	1.000	0.003
LTE Band 5	824.7	3.09	24.00	27.090	0.512	511.682	0.002	0.550	0.003
LTE Band 7	2502.5	5.56	24.00	29.560	0.904	903.649	0.003	1.000	0.003
LTE Band 12	699.7	0.81	24.00	24.810	0.303	302.691	0.001	0.466	0.002
LTE Band 13	779.5	2.20	24.00	26.200	0.417	416.869	0.001	0.520	0.003
LTE Band 14	790.5	2.20	24.00	26.200	0.417	416.869	0.001	0.527	0.003
LTE Band 17	706.5	0.97	24.00	24.970	0.314	314.051	0.001	0.471	0.002
LTE Band 25	1850.7	5.18	24.00	29.180	0.828	827.942	0.003	1.000	0.003
LTE Band 26	814.7	3.09	24.00	27.090	0.512	511.682	0.002	0.543	0.003
LTE Band 30	2307.5	3.56	24.00	27.560	0.570	570.164	0.002	1.000	0.002
LTE Band 38	2572.5	3.92	24.00	27.920	0.619	619.441	0.002	1.000	0.002
LTE Band 41-HPUE	2498.5	5.56	26.00	31.560	1.432	1432.188	0.005	1.000	0.005
LTE Band 48	3552.5	7.45	19.50	26.950	0.495	495.450	0.002	1.000	0.002
LTE Band 66	1710.7	5.18	24.00	29.180	0.828	827.942	0.003	1.000	0.003
LTE Band 71	665.5	0.25	24.00	24.250	0.266	266.073	0.001	0.444	0.002
5G NR n2	1850	3.00	24.00	27.000	0.501	501.187	0.002	1.000	0.002
5G NR n5	824	5.08	24.00	29.080	0.809	809.096	0.003	0.549	0.005
5G NR n12	699	0.81	24.00	24.810	0.303	302.691	0.001	0.466	0.002
5G NR n25	1850	3.00	24.00	27.000	0.501	501.187	0.002	1.000	0.002
5G NR n41	2496	5.56	24.00	29.560	0.904	903.649	0.003	1.000	0.003
5G NR n66	1710	5.18	24.00	29.180	0.828	827.942	0.003	1.000	0.003
5G NR n71	663	0.33	24.00	24.330	0.271	271.019	0.001	0.442	0.002
5G NR n77	3700	7.94	24.00	31.940	1.563	1563.148	0.006	1.000	0.006
5G NR n260	37000	-	-	53.000	199.526	199526.23	0.706	1.000	0.706
5G NR n261	27500	-	-	50.200	104.713	104712.85	0.371	1.000	0.371
Bluetooth	2402	1.67	4.00	5.670	0.00369	3.690	<0.001	1.000	<0.001

Note:

1. For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.
2. This device supports HPUE for LTE band 41 with class 2 power level, so HPUE has been performed standalone power density calculation.
3. LTE band 42/43 covered by LTE band 48 with the same power level, so only chose LTE band 48 to perform standalone power density calculation.
4. Chose the maximum power density to do MPE analysis.

5.2. Collocated Power Density Calculation

WWAN Power Density / Limit	5G NR FR1 Power Density / Limit	Bluetooth Power Density / Limit	Σ (Power Density / Limit) of WWAN + 5G NR FR1 + Bluetooth
0.005	0.006	<0.001	0.012
WWAN Power Density / Limit	5G NR FR2 Power Density / Limit	Bluetooth Power Density / Limit	Σ (Power Density / Limit) of WWAN + 5G NR FR2 + Bluetooth
0.006	0.706	<0.001	0.713

Note:

1. For collocation analysis, LTE Band 41-HPUE is chosen for summation due to the highest (power density/limit) among all LTE Band modes.
2. For collocation analysis, 5G NR FR1 n77 is chosen for summation due to the highest (power density/limit) among all 5G NR FR1 modes.
3. For collocation analysis, 5G NR FR2 n260 is chosen for summation due to the highest (power density/limit) among all 5G NR FR2 modes.
4. Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + 5G NR FR1 + BT and WWAN + 5G NR FR2 + BT.
5. Considering the WWAN and 5G NR module collocation with the Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant

Conclusion:

According to 47 CFR §1.1307(b), the RF exposure analysis concludes that the RF Exposure is FCC compliant.

-----THE END-----