



Radio Frequency Exposure Evaluation Report

For:
Iridium Satellite LLC

Model Number:
9690

Product Description:
Standalone satellite device with Java application programming environment. Includes internal power supply, Iridium Short Burst Data Transceiver, GNSS, BLE, I/O, RS232, RS485, CAN.

FCC ID: Q639690
IC ID: 4629A-9690

Per:
CFR Part Part1 (1.1307 & 1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISED RSS-102 Issue 5

Report number: EMC_METOC-003-19001_FCC_ISED_MPE_REV1

DATE: 2020-08-12



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1 Assessment

This RF Exposure evaluation report provides evidence for compliance of the below identified device with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 (1.1307 & 1.1310), Part 2 (2.1091) and IC standard RSS-102 issue 5 under worst case conditions (measured or rated RF output power, antenna gain, distance towards human body, multiple transmitter information as presented by the applicant).

In addition, maximum antenna gain or minimum distance towards the human body is calculated respectively, where relevant.

The device meets the limits as stipulated by the above given FCC and IC rule parts based on available specifications for worst case conditions at 20cm distance to the body.

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Report reviewed by:

2020-08-12	Compliance	Cindy Li (EMC Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2020-08-12	Compliance	Chin Ming Lui (Associate EMC Engineer)	
Date	Section	Name	Signature

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Lab Manager:	Cindy Li
Responsible Project Leader:	Rami Saman

2.2 Identification of the Client / Manufacturer

Client's Name:	Iridium Satellite LLC
Street Address:	1750 Tysons Blvd. #1400
City/Zip Code	McLean, VA 22102
Country	USA
Contact Person:	Scott Mallonee
Phone No.	1-703-287-7400
e-mail:	scott.mallonee@iridium.com

Identification of the Manufacturer

Manufacturer's Name:	MetOcean Telematics
Manufacturers Address:	11 Thornhill Drive
City/Zip Code	Dartmouth, Nova Scotia B3B1R9
Country	Canada
Contact Person:	Scott Feener
Phone No.	902-468-2505
e-mail:	sfeener@metocean.com

3 Equipment under Assessment

Marketing name:	Iridium Edge Pro
HW Version :	SA-200050-00
SW Version :	0.1
Firmware Version Identification Number (FVIN):	N/A
Hardware Version Identification Number (HVIN):	9690
Product Marketing Name (PMN):	Iridium Edge Pro
Regulatory Band:	<ul style="list-style-type: none"> ❖ <u>Bluetooth LE 5.0:</u> <ul style="list-style-type: none"> ▪ Nominal band: 2400 MHz – 2483.5 MHz; ▪ Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 channels ❖ <u>Iridium:</u> <ul style="list-style-type: none"> ▪ Nominal band: 1616 MHz – 1626.5 MHz
Integrated Module Info:	<ul style="list-style-type: none"> ❖ <u>Bluetooth LE 5.0:</u> <ul style="list-style-type: none"> ▪ Module name: u-blox NINA-B1 Series ▪ Module number: NINA-B112 ▪ FCC/IC ID: XPYNINAB1 / 8595A-NINAB1 ❖ <u>GNSS:</u> <ul style="list-style-type: none"> ▪ Module name: u-blox NEO-M8 Series ▪ Module number: NEO-M8N ❖ <u>Iridium:</u> <ul style="list-style-type: none"> ▪ Module name: Iridium ▪ Module number 9603N ▪ FCC/IC ID: Q639603N / 1792A-9603N
Antenna Information:	<ul style="list-style-type: none"> ❖ <u>Bluetooth LE 5.0:</u> <ul style="list-style-type: none"> ▪ Type: Integrated ▪ Location: Internal ▪ Antenna gain: 2 dBi ❖ <u>GNSS:</u> <ul style="list-style-type: none"> ▪ Location: Internal ❖ <u>Iridium:</u> <ul style="list-style-type: none"> ▪ Type: 2J – 2JCP3642603A ▪ Location: Internal ▪ Peak gain: 4.5 dBiC / Average gain: -1.1 dBiC

Maximum Output Power:	❖ <u>Bluetooth LE 5.0:</u> Conducted: 0.0026 W <small>Note 1</small> ❖ <u>Iridium:</u> Conducted: 2.61 dBW (1.82 W) <small>Note 2</small>
Power Supply/ Rated Operating Voltage Range:	Low 7 VDC, Nominal 12 VDC, High 32 VDC
Operating Temperature Range:	Low -40°C, Nominal 25° C, High 85°C
Sample Revision:	<input type="checkbox"/> Prototype Unit; <input checked="" type="checkbox"/> Production Unit; <input type="checkbox"/> Pre-Production

Note 1: Leveraged from Bluetooth module NINAB1 certification grant (FCC ID: XPYNINAB1, IC ID: 8595A-NINAB1)

Note 2: Leveraged from Iridium Communications Inc. 9603N Test Report prepared by TÜV SÜD, Document 75926443 Report 05 Issue 2 (FCC ID: Q639603N, IC ID: 1792A-9603N)

4 RF Exposure Limits and FCC and IC Basic Rules

For the specific described radio apparatus the following basic limits and rules apply for both, FCC and IC where not indicated differently.

4.1 Power Density Limits acc. to FCC 1.1310(e) / RSS-102 i5, cl. 4:

FCC

Frequency Range (MHz)	Power density (mW/cm ²)	Averaging time (minutes)
300 – 1500	$f \text{ (MHz)} / 1500$	30
1500 – 100000	1.0	30

IC

300 – 6000	$0.02619 \times f \text{ (MHz)}^{0.6834}$	6
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4.2 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.1091(c) / RSS-102, cl. 2.5 (rounded to 1 decimal point):

FCC

operating frequency < 1.5GHz: excluded if ERP < 1.5W / 31.8dBm (EIRP: 33.9 dBm);

operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm (EIRP: 36.9 dBm);

IC

300MHz <= operating frequency < 6 GHz: excluded if EIRP < $0.0131 \times f \text{ (MHz)}^{0.6834} \text{ W}$

4.3 RF Exposure Estimation (MPE Estimation)

Having available the source based average output power and peak antenna gain or the ERP/EIRP of the specified device and for a known minimum distance of its radiating structures from the body of persons according to its use cases (at least 20cm) the power density at that distance can be estimated by the following formula for plane-wave equivalent conditions (far-field conditions), when ground reflection is neglected.

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

where: S = power density (mW/cm² or W/m²)

P = power input to the antenna (mW or W)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (cm or m)

5 Evaluations

5.1 Analysis of RF Exposure for simultaneous transmission

- Evaluations are based on worst case power density limits for Canada.
- Calculations are made for 20cm.
- Evaluations are based on ERP/EIRP measured or calculated from known gain and conducted output power.

Radio	Freq [MHz]	Max Conducted power [W]	Gain Note 2	Gain [lin]	EIRP [W]	EIRP with Duty Cycle [W] Note 3	IC Limit [W/m2]	FCC Llimit [W/m2]	Actual [W/m2] ²	How much of limit is used up
BLE	2400	0.0026	2	1.58	0.00412	-	5.348	10.000	0.00744	0.13%
Iridium	1616	1.82	4.5	2.82	5.129	0.472	4.081	10.000	0.939	22.98%

Note 1: The calculation is based on the distance of 20cm

Note 2: Antenna Gain units:

- BLE → dBi
- Iridium → dBiC

Note 3: Device is a single-carrier Iridium AES. Duty cycle of the Iridium radio is 9.2%, based on one 8.28 ms uplink time-slot of a 90 ms Iridium TDMA frame specified in "ICAO Technical Specification for Aeronautical Mobile Satellite (Route) Service (AMS(R)S)" document provided by Iridium Satellite System

5.2 Conclusion:

The Iridium radio has the worst-case transmission, which is using 22.98% of a limit of 100%. The equipment is passing RF exposure requirements for 20cm distance.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
2020-07-10	EMC_METOC-003-19001_FCC_ISED_MPE	Initial Release	Chin Ming Lui
2020-08-12	EMC_METOC-003-19001_FCC_ISED_MPE	Changed Iridium Antenna gain from dBi to dBiC Changed distance to body of persons from 21 cm to 20 cm Leveraged conducted power from test report instead of e.i.r.p. value from certification grant for Iridium 9603N module Re-did RF exposure calculation for Iridium radio	Chin Ming Lui

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