H.B. Compliance Solutions

RF Exposure MPE Report

For the

Globalstar, Inc.

RM200

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Prepared for:

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Cert # ATL-0062-E

1. Equipment Overview

Product Name:	RM200M
Model(s) Tested:	RM200M
FCC ID:	L2V-RX200M
Supply Voltage Input:	Primary Power: +16-24 VAC/VDC)
Frequency Range:	BLE (2402-2480MHz), Satellite (1611.25-1618.75MHz)
No. of Channels:	BLE (40 Channels), Satellite (4 Channels)
Type(s) of Modulation:	BLE – GFSK, Satellite - BPSK
Range of Operation Power:	BLE - 0.0056W (Conducted), Satellite – 0.6095W (EIRP)
Emission Designator:	2M00G1D
Channel Spacing(s)	Satellite – 2.5MHz
Test Item:	Pre-Production
Type of Equipment:	Mobile
Antenna Requirement (§15.203) :	Type of Antenna: Ceramic SMT(BLE), Patch (Satellite) Gain of Antenna: 1.3dBi (BLE), 3.77dBi (Satellite)
Environmental Test Conditions:	Temperature: 15-35°C Humidity: 30-60% Barometric Pressure: 860-1060 mbar
Modification to the EUT:	None

2. Applicable Standard

According to §1.1307 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 §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter. Test Limits

Evaluated against exposure limits: General Use __X__ or Controlled Use ____

Maximum Permissible Exposure (MPE)

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 Exposure				
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
300–1,500			f/300	6
1,500–100,000			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
300–1,500			f/1500	30
1,500–100,000			1.0	30

f = frequency in MHz* = Plane-wave equivalent power density
RF exposure compliance will need to be determined with respect to 1.1307(c) and (d) of the FCC rules.
The emissions should be within the limits at 300kHz in the above table. (Use 300kHz limits for 150kHz)

3. Test Results

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG/4\pi R^2$

Where,

S = power density (mW/cm2)
P = output power at the antenna terminal (mW)
G = gain of transmit antenna (numeric)
R = distance from transmitting antenna (cm)

For Satellite Transmitter

Maximum peak output power at antenna input terminal = 24.08 (dBm)*
Maximum peak output power at antenna input terminal = 255.85 (mW)
Antenna gain (typical) = 3.77 (dBi)
Maximum antenna gain = 2.38 (numeric)
Prediction distance = 20 (cm)
Prediction frequency = 1618.75 (MHz)
MPE limit for uncontrolled exposure at prediction frequency = 1.0 (mW/cm^2)
Power density at prediction frequency = 0.12107 (mW/cm^2)

*Includes 1dB of manufacturer output power tolerance.

To solve for the minimum mounting distance required;

$R = \sqrt{(PG/4\pi S)}$

R = √ (255.85 x 2.38 / 4π x 0.12107) = 20 cm (Based on continuous transmission)

For Bluetooth Transmitter

Maximum peak output power at antenna input terminal = 7.53 (dBm)
Maximum peak output power at antenna input terminal = 5.66 (mW)
Antenna gain (typical) = 1.3 (dBi)
Maximum antenna gain = 1.35 (numeric)
Prediction distance = 20 (cm)
Prediction frequency = 2480 (MHz)
MPE limit for uncontrolled exposure at prediction frequency = 1.0 (mW/cm^2)
Power density at prediction frequency = 0.00152 (mW/cm^2)

To solve for the minimum mounting distance required;

R = √ (PG/4πS)

R = √ (5.66 x 1.35 / 4π x 0.00152) = 20 cm (Based on continuous transmission)

Simultaneous Transmission Evaluation

Limit
The sum of the ratios of the peak or spatially averaged results to the applicable frequency dependent MPE limits must be <1 at all locations where users and bystanders can by exposed.

Calculation

Mode	Bluetooth Power Density/Limit	Sat Power Density/Limit	∑(Power Density/Limit) of SAT+Bluetooth
Satellite		0.1210	
Bluetooth	0.00152		0.1225

The Satellite Bluetooth transmitter, the aggregated (power density/limit) is smaller than 1, and the MPE of 2 collocated transmitters is compliant.

END OF TEST REPORT