

1. RF Exposure Requirements

1.1 General Information

Client Information

Applicant: Bit Part LLC
Address of applicant: 224 W 35th St, Ste 500 PMB 497, New York, NY 10001

Manufacturer: Bit Part LLC
Address of manufacturer: 224 W 35th St, Ste 500 PMB 497, New York, NY 10001

General Description of EUT:

Product Name: bitbox radio module
Trade Name: /
Model No.: BP.BBR.V1.915
Adding Model(s): /
Rated Voltage: DC3.3V
Battery Capacity: /
FCC ID: 2BGOC-BR1X900
Equipment Type: Mobile device

Technical Characteristics of EUT:

SRD(900MHz)

Frequency Range: 902-928MHz
Bandwidth:1MHz:27.47dBm (Conducted)
RF Output Power: Bandwidth:2MHz:27.59dBm (Conducted)
Bandwidth:4MHz:28.00dBm (Conducted)
Bandwidth:8MHz:28.83dBm (Conducted)
Modulation: BPSK,QPSK,16QAM,64QAM
Bandwidth:1MHz:24
Quantity of Channels: Bandwidth:2MHz:11
Bandwidth:4MHz:6
Bandwidth:8MHz:3
Channel Separation: Bandwidth:1MHz: 1MHz
Bandwidth:2MHz: 2MHz
Bandwidth:4MHz: 4MHz
Bandwidth:8MHz: 8MHz
Type of Antenna: External Antenna
Antenna Gain: Antenna type 1:0.08dBi
Antenna type 2:0.51dBi

1.2 RF Exposure Exemption

According to §1.1307(b)(3) and KDB 447498 D04 Interim General RF Exposure Guidance v01, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Option A: FCC Rule Part 1.1307 (b)(3)(i)(A): The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

Option B: FCC Rule Part 1.1307 (b)(3)(i)(B): The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Option C: FCC Rule Part 1.1307 (b)(3)(i)(C): The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$
1.34-30	$3,450 R^2/f^2$
30-300	$3.83 R^2$
300-1,500	$0.0128 R^2 f$
1,500-100,000	$19.2 R^2$

For Multiple RF sources: FCC Rule Part 1.1307(b)(3)(ii):

- (A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required).
- (B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

1.3 Calculated Result

Radio Access Technology	Prediction Frequency	Output Power	Antenna Gain	Duty Cycle	Tune-Up Time-Averaged Power	ERP
	(MHz)	(dBm)	(dBi)	(%)	(dBm)	(dBm)
SRD(900MHz)_ (Antenna type 1)	902	28.83	0.08	100	29.00	26.93
SRD(900MHz)_ (Antenna type 2)	902	28.83	0.51	100	29.00	27.36

Frequency (MHz)	Option	Min. Distance	Max. Power		Exposure Limit	Ratio	Result
		(cm)	(dBm)	(mW)	(mW)		Pass/Fail
902	B	20	29.00	794.33	1840.08	0.43	Pass
902	B	20	29.00	794.33	1840.08	0.43	Pass

*Note: 1. Time-Averaged Power=Output Power * Duty Cycle; ERP= Time-Averaged Power+ Antenna gain-2.15dB*

2. Option A, B and C refers as clause 1.2.

3. For option B, Max (time-averaged power, effective radiated power (ERP)) converts to Max. Power. For option C, ERP converts to Max. Power;

4. For option B, P_{th} (mW) converts to Exposure Limit (mW); For option C, ERP (W) converts to Exposure Limit (mW).

5. Ratio= Tune-Up ERP (mW)/ Exposure Limit (mW)

Mode for Simultaneous Multi-band Transmission:

Radio Access Technology	Ratio 1	Ratio 2	Simultaneous Ratio	Limit	Result
					Pass/Fail
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Note: Antenna type 1 and Antenna type 2 can't transmit at the same time.

Result: Pass