

# 1. RF Exposure Requirements

---

## 1.1 General Information

### Client Information

Applicant: AFCO INC.  
Address of applicant: 122 Gayoso Ave Memphis, TN 38103

Manufacturer: SHENZHEN TOKWA PRECISION TECHNOLOGY CO., LTD .  
Address of manufacturer: A5 Building, Tongxin Industrial Zon, No.87, Tongxin Road, Longgang District, Shenzhen City, Guangdong Province, P.R.China

### General Description of EUT:

Product Name: Marine Media Center  
Trade Name: MEMPHIS  
Model No.: MXAZ24MC  
Adding Model(s): KSM1803  
Rated Voltage: DC 14.4V  
Battery Capacity: /  
Adapter Model: /  
Software Version: /  
Hardware Version: KGM1803\_TFT\_VER1.0  
FCC ID: QWI-MXAZ24MC  
Equipment Type: Mobile device

### Technical Characteristics of EUT:

#### Bluetooth

Bluetooth Version: V3.0 (BR/EDR mode)  
Frequency Range: 2402-2480MHz  
RF Output Power: -2.39dBm (Conducted)  
Data Rate: 1Mbps, 2Mbps, 3Mbps  
Modulation: GFSK,  $\pi/4$  DQPSK, 8DPSK  
Quantity of Channels: 79  
Channel Separation: 1MHz  
Type of Antenna: PCB Antenna  
Antenna Gain: 3.3dBi

## 1.2 RF Exposure Exemption

According to §1.1307(b)(3) and 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  $\lambda$  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 | Min. Frequency | Max. Output Power | Max. Tune-Up Output Power | Antenna Gain | Duty Cycle | Tune-Up EIRP |
|-------------------------|----------------|-------------------|---------------------------|--------------|------------|--------------|
|                         | (MHz)          | (dBm)             | (dBm)                     | (dBi)        | (%)        | (dBm)        |
| Bluetooth               | 2402           | -2.39             | -2.0                      | 3.3          | 100        | 1.30         |

| Frequency (MHz) | Option | Min. Distance | Tune-Up ERP |      | Exposure Limit | Ratio | Result    |
|-----------------|--------|---------------|-------------|------|----------------|-------|-----------|
|                 |        | (cm)          | (dBm)       | (mW) | (mW)           |       | Pass/Fail |
| 2402            | C      | 20.00         | -0.85       | 0.82 | 768.00         | 0.01  | Pass      |

Note: 1.  $ERP = EIRP - 2.15 \text{ dB}$ ;  $EIRP = \text{Output Power} + \text{Antenna gain}$

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

3. For option B,  $P_{th}(\text{mW})$  convert to  $Exposure Limit(\text{mW})$ ; For option C,  $ERP(\text{W})$  convert to  $Exposure Limit(\text{mW})$ .

4.  $Ratio = \text{Tune-Up ERP}(\text{mW}) / \text{Exposure Limit}(\text{mW})$

#### Mode for Simultaneous Multi-band Transmission:

| Radio Access Technology | Ratio 1 | Ratio 2 | Simultaneous Ratio | Limit | Result    |
|-------------------------|---------|---------|--------------------|-------|-----------|
|                         |         |         |                    |       | Pass/Fail |
| --                      | --      | --      | --                 | --    | --        |

Result: Pass