

LLB10051M

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RF Exposure calculations

Based on FCC 1.1307 & 2.1091, FCC OET Bulletin 65.

(1) Categorically Exclusion from RF exposure Evaluation:

According to FCC regulations, RF exposure evaluation is Categorically Excluded if transmitter's operation frequency is less than 1.5 Ghz and ERP is less than 1.5 watt.

(2) Absolute Maximum specifications of
LLB10051M transmitter

- Operational frequency band **450 MHz to 470 MHz.**
- The LLB10051M transmitter is measured for **Max RF Power = 0.794 W.**
- Absolute **Maximum transmission time (duration)** for any Hexagram transmitters does not exceed **150 mS** (0.15second).
- Transmission period - Absolute maximum is **1 transmission per 4 hours.**
- All Hexagram Transmitters utilize **FSK modulation.**

As stated in (1), **the hexagram transmitters do not require RF Exposure evaluation.**

But, we continue with calculations of safety of RF exposure on TIMCO's request.

(3) Average RF Power Calculation:

FCC regulations on permissible RF exposure are not based on peak envelope power (PEP), but on average power (P_{ave}) over a 30-minute time period for uncontrolled environments.

As mentioned in (2), during any 30 minute Hexagram MTU can transmit only once. Duration = 0.15 second.

With maximum RF radiation equal to 0.794 W, the Average RF Power over 30 minutes is:

**P_ave (worst case) at 30 minute=
= 794mW*1* [0.15sec/((30*60)sec)]=794*0.000083=66 uW**

(4) Maximum Radiated Power Density prediction (S):

To predict power density (S) at distance R=20 cm from transmitter with P_ave = 0.00007W, next formula is used:

$$S = P_{ave} / (4 * (PI) * R^2) .$$

For the worst of the worst worst-case prediction of power density at or near a transmitter surface let's use:

$$S = P_{ave} / ((PI) * R^2) = 66uW / (3.14 * 20cm * 20cm) = \\ = 0.053 uW/cm^2$$

This is the impossible worst Case of the near field power density of **LLB10051M** transmitter.

(5) Maximum Permissible Exposure (MPE) from LLB10051M:

AS FCC require, the maximum permissible exposure for general public in "uncontrolled situation" at 20 cm is:

$$MPE = frequency[MHz] / 1500 == 460MHz / 1500 = 0.307 mW/cm^2 .$$

Compare results in (4) and (5),

$$S=0.053uW/cm^2 \lll MPE=0.307 mW/cm^2$$

We see that LLB10051M fully complies with RF safety at a distance of 20 cm.

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