RF Exposure Considerations for the LINK.10

FCC ID: 2ALENLINK10

The above device operates using a 13.56 MHz transmitter and uses a pre-certified Bluetooth LE Module (FCC ID: XPYNORAB1) in 2402-2480MHz frequency band. The transmitters can transmit simultaneously. The FCC requires that the calculated MPE be equal to or less than a given limit dependent on frequency at a distance of 20 cm from a device to the body of a user.

The following FCC Rule Parts and procedures are applicable:

- Part 1.1310 – Radiofrequency radiation exposure limits
- Part 2.1091 – Radiofrequency radiation exposure evaluation: mobile devices
- KDB447498 D01 v06 – Mobile and Portable Devices RF Exposure Procedures and Equipment Authorisation Policies

LINK.10 MAXIMUM TRANSMITTER POWER CONSIDERATIONS

13.56 MHz:
Tx Power$_{max}$ (declared): 16.92 dBµV/m @30m = 56.92 dBµV/m @3m* = -38.28 dBm EIRP
* Extrapolation factor of 40 dB was used for calculation.

2402-2480 MHz (pre-certified Bluetooth LE Module (FCC ID: XPYNORAB1):
Tx Power: 3.0 dBm (conducted)
Antenna gain: 2.0 dBi
EIRP = 3.0 dBm + 2.0 dBi = 5.0 dBm

MPE CALCULATIONS
The MPE calculation to calculate the safe operating distance for the user is.

$$S = EIRP/4 \, \pi \, R^2$$

Where   S = Power density
               EIRP = Effective Isotropic Radiated Power
R = distance to the centre of radiation of the antenna (safe operating distance)

For 13.56MHz:
Values:
EIRP   = -38.28 dBm
         = 0.15×10^{-6} W
         = 0.15×10^{-3} mW
R = 20cm

Power Density Requirement
From Table 1 to § 1.1310(e)(1)- Limits for General Population/ Uncontrolled Exposure of
FCC Rule Part 1.1310 for 13.56MHz

$$S_{req1} = 180/f^2$$
$$= 0.98 \text{ mW/cm}^2$$

Calculation:

$$S = 0.15 \times 10^{-3}/4 \pi R^2$$
$$S = 0.15 \times 10^{-3}/(12.56 \times 20^2)$$
$$S = 0.15 \times 10^{-3}/(5024)$$
$$\mathbf{S_1 = 3 \times 10^{-8}\ mW/cm^2}\ (< 0.98\ mW/cm^2)$$

For 2402-2480 MHz:

Values:

EIRP = 5.0 dBm

= 3.2 mW

R = 20cm

Power Density Requirement

From Table 1 to § 1.1310(e)(1)- Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for 2402-2480 MHz

$$\mathbf{S_{req2} = 1.0\ mW/cm^2}$$

Calculation:

$$S = 3.2/4 \pi R^2$$
$$S = 3.2/(12.56 \times 20^2)$$
$$S = 3.2/(5024)$$
$$\mathbf{S_2 = 0.0006\ mW/cm^2}\ (<1.0\ mW/cm^2)$$

KDB447498 D01 v06 Section 7.2 SIMULTANEOUS TRANSMISSION CONSIDERATIONS

The equipment operates from a single antenna. All transmitters can transmit simultaneously.

As per KDB, summation of calculated MPE ratios for 13.56 MHz and 2402-2480 MHz:

$$\mathbf{\Sigma MPE_{ratios} = (S_1/ S_{req1}) + (S_2/ S_{req2})}$$
$$= (3 \times 10^{-8}/0.98) + (0.0006/1.0)$$
$$\mathbf{= 0.0006}$$

Σ of MPE ratios<1.0, so in accordance with KDB447498 Section 7.2, simultaneous transmission test exclusion applies for the transmitters.

Conclusion

The required 20cm RF exposure limits for General Population/Uncontrolled Exposure will not be exceeded for the LINK.10.

Yours sincerely
BELIMO Automation AG

Jorge Flores Vega, Product/Project Lead