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RF EXPOSURE EVALUATION

1. PRODUCT INFORMATION

Product Description	**LoRa+BLE Module**
Model Name	MKL62BA-US915
FCC ID	**2AO94-MKL62BA**
Max. output power	BLE:1.38dBm(1.374mW) 915MHz:90.10dBuV/m (-7.11dBm\0.19mW)

2. EVALUATION METHOD AND LIMIT

Human exposure to RF emissions from mobile devices (47 CFR §2.1091) may be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field strength and/or power density, as appropriate, since exposures are assumed to occur at distances of 20 cm or more from persons.

LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE

Frequency Range (MHz)	E-field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (Minutes)
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 -- 1500	--	--	f/1500	30
1500 -- 100,000	--	--	1.0	30

*Note:

1. f= Frequency in MHz * Plane-wave Equivalent Power Density
2. The averaging time for General Population/Uncontrolled exposure to fixed transmitters is not applicable for mobile and portable transmitters. See 47 CFR §§2.1091 and 2.1093 on source-based time-averaging requirement for mobile and portable transmitters.

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

Where:

S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

3. CALCULATION

A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated.

915MHz

Antenna Gain=2.0dBi, π=3.14

Frequency	Output Power	EIRP Power	Power Density	Power Density Limit
MHz	dBm	mW	mW/cm^2	mW/cm^2
915	-7.11	0.30	0.00006	0.61

According to the follow transmitter output power（P_t）formula：
P_t=（E x d）^{2}/（30 x g_t）
P_t=transmitter output power in watts
g_t=numeric gain of the transmitting antenna (unitess)
E=electric field strength in V/m
d=measurement distance in meters (m)

According to the formula described above:

Emax=**90.10**dBuv/m=0.032V/m, d=3m, g_t=1.58

P_t=（E x d）^{2}/（30 x g_t）=(**0.032**x3)^2 / (30x1.58)=**0.00019**W=**0.19**mW

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BLE PART (Worst case 2440MHz)

Antenna Gain=0.50dBi, π=3.14

Frequency	Output Power	EIRP Power	Power Density	Power Density Limit
MHz	dBm	mW	mW/cm^2	mW/cm^2
2440	1.38	1.54	0.00031	1

Note:

1. Only the worst case recorded.
2. The 2.4G BLE and 915MHz can transmit simultaneously and
   MPE ratio (BLE+915MHz) = 0.00031 / 1.0 + 0.00006 / 0.61 = 0.000408< 0.61
   and it satisfy the RF exposure requirements for simultaneous transmission that the sum of the MPE radios < 0.61 < 1