# RF EXPOSURE EVALUATION

## 1. PRODUCT INFORMATION

| | |
|---|---|
| Product Description | Altro Smart Lock |
| Model Name | ModelX |
| FCC ID | 2AQTVSMARTLOCKX |

## 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

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

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## 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.

BT: Antenna Gain=1.6dBi (Numeric 1.45), π=3.14

| Frequency | Output Power | Output Power | Power Density | Power Density Limit |
|---|---|---|---|---|
| MHz | dBm | mW | $mW/cm^2$ | $mW/cm^2$ |
| 2440 | 0.830 | 1.21 | 0.00035 | 1 |

2.4G WIFI Antenna Gain=3.0dBi (Numeric 2), π=3.14

| Frequency | Output Power | Output Power | Power Density | Power Density Limit |
|---|---|---|---|---|
| MHz | dBm | mW | $mW/cm^2$ | $mW/cm^2$ |
| 2412 | 15.65 | 36.73 | 0.01462 | 1 |

5G WIFI Antenna Gain=4.0dBi (Numeric 2.51), π=3.14

| Frequency | Output Power | Output Power | Power Density | Power Density Limit |
|---|---|---|---|---|
| MHz | dBm | mW | $mW/cm^2$ | $mW/cm^2$ |
| 5320 | 18.51 | 36.73 | 0.00924 | 1 |

Note:
1. Only the worst case recorded.
2. The 2.4GHz WIFI band,BT and 5GHz band can transmit simultaneously:
   0.00035/1+0.01462/1+0.00924/1=0.02421<1

## 4.conclusion

Compliance the RF exposure requirement

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