

FCC RF Exposure

EUT Description: Smart Lock

Test type.: B29

Series model: B12, B25

FCC ID: 2BMEM-B29

Equipment type: Mobile equipment

Test procedures according to the technical standards: KDB 447498 D01 V06 and FCC 2.1091.

1. Limits

The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm ²) | Averaging time (minutes) |
|---|-------------------------------------|----------------------------------|--|-----------------------------|
| (A) Limits for Occupational/Controlled Exposures | | | | |
| 0.3–3.0 | 614 | 1.63 | *(100) | 6 |
| 3.0–30 | 1842/f | 4.89/f | *(900/f ²) | 6 |
| 30–300 | 61.4 | 0.163 | 1.0 | 6 |
| 300–1500 | | | f/300 | 6 |
| 1500–100,000 | | | 5 | 6 |
| (B) Limits for General Population/Uncontrolled Exposure | | | | |
| 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 |

F = frequency in MHz

Formula: $Pd = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$

Where :

Pd = power density in mW/cm²,

Pout = output power to antenna in mW;

G = gain of antenna in linear scale,

$\pi = 3.14$;

R = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

3. Test Result of RF Exposure Evaluation BLE

| Modulation | Channel Freq. (MHz) | Conduct ed power (dBm) | Max tune-up power (mW) | Antenna Gain (dBi) | Antenna gain numeric | Evaluation result (mW/cm2) | Power density Limits (mW/cm2) |
|------------|---------------------|------------------------|------------------------|--------------------|----------------------|-----------------------------|-------------------------------|
| GFSK | 2402 | 1.86 | 1.534616 | 1.2232 | 1.325 | 0.000404731 | 1 |
| | 2440 | -1.98 | 0.633869 | 1.2232 | 1.325 | 0.000167173 | 1 |
| | 2480 | -1.57 | 0.696626 | 1.2232 | 1.325 | 0.000183724 | 1 |

Conclusion: the max result : $0.00023 \leq 1.0$ compliance with FCC's RF Exposure.

TX frequency range: 13.56MHz

Operation Frequency: NFC: 13.56MHz Power density limited: 4.89466(mW/cm2) Antenna

Type: Induction coil

R=20cm

$EIRP = E - 104.7 + 20 \log D = 62.45 - 104.7 + 20 \log 3 = -32.707 \text{ dBm}$

Maximum Conducted Output Power: -32.707dBm

NFC

| Frequency(MHz) | EIRP Power (dBm) | EIRP Power (mW) | Turn-up (dBm) | Max Turn-up (dBm) | Evaluation result (mW/cm2) | Power density Limits (mW/cm2) |
|----------------|------------------|-----------------|---------------|-------------------|----------------------------|-------------------------------|
| 13.56 | -32.70 | 0.0005 | -32± 1 | -31 | 0.0000050 | 4.89466 |

Conclusion: the max result :BLE:0.00023+NFC:0.0000050=0.000235 ≤ 1.0 compliance with FCC's RF Exposure.

Conclusion: No SAR is required