## RF Exposure Evaluation

### 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

Friis transmission formula: **Pd = (Pout\*G)/(4\*pi\*r$^2$)**

Where

**Pd** = power density in mW/cm$^2$, **Pout** = output power to antenna in mW;

**G** = gain of antenna in linear scale, **Pi** = 3.1416;

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

Pd id the limit of MPE, 1 mW/cm$^2$. 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.

### Test Procedure

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

## Test Result of RF Exposure Evaluation

| Mode | Channel | Output power to antenna (dBm) | Tune-up power (dBm) | Output power to antenna (mW) | Power Density at R=20cm (mW/cm$^2$) | Limit (mW/cm$^2$) | Result |
|---|---|---|---|---|---|---|---|
| 2.4G WIFI | 802.11b | 9.90 | 9±1 | 10.0 | 0.0043 | 1.0 | PASS |
| BLE | 2480 | -0.23 | 0±1 | 1.26 | 0.0003 | 1.0 | PASS |

The device could support transmission with WIFI and BT simultaneously.

Power Density at R=20cm (mW/cm$^2$):0.0043+0.0003=0.0046 〈1.0 Limit (mW/cm$^2$), So a SAR test is not required.

Remark: antenna gain=3.31dBi

Shenzhen ZKT Technology Co., Ltd.
1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen,China

☎ +86-400-000-9970     🖨 +86-755-2233 6688     ✉ zkt@zkt-lab.com     🌐 www.zkt-lab.com

# RF Exposure Evaluation

According to KDB447498 D01 General RF Exposure Guidance v06 Section 4.3.1 Standalone SAR test exclusion considerations:Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition(s), listed below, is (are) satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channe requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.The minimum test separation distance defined in 4.1 f) is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander. To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified, typically in the SAR measurement or SAR analysis report, by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting are required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops and tablets, etc.

c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion (also illustrated in Appendix C):

1) For test separation distances > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by

$[1 + \log(100/f(MHz))]$

2) For test separation distances ≤ 50 mm, the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by ½

(1)Pb(mW)*[1+log(100/f(MHz))]= 474mW*[1+log(100/f(MHz))]

(2)Pb(mW)*[1+log(100/f(MHz))]*0.5=474mW*[1+log(100/f(MHz))]*0.5=237*[1+log(100/f(MHz))]

Test Procedure:

TX frequency range: 13.56MHz

Device category: Portable device (Distance: 5mm) Max.

Field Strength: 104.56dBuV/m @3m

EIRP=E-104.7+20logD=104.56-104.7+20log3=9.40dBm

Maximum Conducted Output Power: 9.40dBm

Turn-up: 9±1

Here,

| Frequency(MHz) | Min. Distance (mm) | Max Power (dBm) | Tune-up power (dBm) | Max Power (mW) | Limit (mW) | SAR Test Exclusion |
|---|---|---|---|---|---|---|
| 13.56 | ≤ 50 | 9.40 | 9±1 | 10 | 442.654 | Yes |

The device could support transmission with WIFI, BT and NFC simultaneously.0.0043+0.0003+0.0023=0.0069 〈1.0, So a SAR test is not required