## 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/cm2) | 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/f2) | 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/f2) | 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*r2)

Where

Pd = power density in mW/cm2, 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/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.

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

BLE

| Mode | Output power to antenna (dBm) | Output power to antenna (mW) | Power Density at R=20cm (mW/cm²) | Limit (mW/cm²) | Result |
|---|---|---|---|---|---|
| GFSK | 0.94 | 1.24 | 0.0002 | 1.0 | PASS |

So a SAR test is not required

RF Exposure Evaluation

According to KDB447498 D01 General RF Exposure Guidance v06 Section 4.3.1Standalone SAR test exclusion considerations:Unless specifically required by thepublished RF exposure KDB procedures, standalone 1-g head or body and 10-g extremitySAR evaluation for general population exposure conditions, by measurement or numericalsimulation, is not required when the corresponding SAR Test Exclusion Thresholdcondition(s), listed below, is (are) satisfied. These test exclusion conditions are based onsource-based time-averaged maximum conducted output power of the RF channerequiring evaluation, adjusted for tune-up tolerance, and the minimum test separationdistance required for the exposure conditions.The minimum test separation distancedefined in 4.1 f) is determined by the smallest distance from the antenna and radiatingstructures or outer surface of the device, according to the host form factor, exposureconditions and platform requirements, to any part of the body or extremity of a user orbystander. To qualify for SAR test exclusion, the test separation distances applied must befully explained and justified, typically in the SAR measurement or SAR analysis report, bythe operating configurations and exposure conditions of the transmitter and applicable hostplatform requirements, according to the required published RF exposure KDB procedures.When no other RF exposure testing or reporting are required, a statement of justificationand compliance must be included in the equipment approval, in lieu of the SAR report, toaualify for SAR test exclusion. When required, the device specific conditions described inthe other published RF exposure KDB procedures must be satisfied before applying theseSAR 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 thecorresponding 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 equationin c)1)for 50 mm and 100 MHz is multiplied by ½

(1)Pb(mw)*[1+og(100/f(MHz))]=474mW*[1+0g(100/f(MHz))](2)Pb(mW)*[1+0g(100/(MHz))]*0.5= 474mW*[1+l0g(100/f(MHz))]*0.5=237*[1+10g(100/f(MHz))]

Test Procedure:

TX frequency range: 13.56MHz

Device category: Stationary type equipment (Distance: 20cm) Max.Field Strength: 68.58dBuV/m @3m

EIRP=E-104.7+20l0gD=68.58-104.7+20l0g3=-26.58dBm

Here,

| Frequency(MHz) | Min. Distance (cm) | Max Power (dBm) | Tune-up power (dBm) | Max Power (mW) | Limit (mW) | SAR Test Exclusion |
|---|---|---|---|---|---|---|
| 13.56 | 20 | -26.58 | -26+1 | 0.0003 | 885.309 | Yes |

The device does not support the simultaneous operation of RFID and BLE transmission

So a SAR test is not required