# RF EXPOSURE EVALUATION

According to FCC 1.1310: 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 Exposure** | | | | |
| 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 |
| 300-1,500 | | | f/300 | 6 |
| 1,500-100,000 | | | 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 |
| 300-1,500 | | | f/1500 | 30 |
| 1,500-100,000 | | | 1.0 | 30 |

f = frequency in MHz * = Plane-wave equivalent power density

## MPE Calculation Method

E (V/m) = $\frac{\sqrt{30 * P * G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$Pd = \frac{30 * P * G}{377 * D^2}$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

## Measurement Result

Operation Frequency: GFSK: 905 MHz~926.5MHz
Antenna Type: PCB antenna
Antenna gain: Antenna: -2 dBi
R=20cm

OCW=120KHz-jeweller

| Channel Freq. (MHz) | modulation | conducted power (dBm) | Tune-up power (dBm) | Max | | Antenna | | Evaluation result (mW/cm2 ) | Power density Limits (mW/cm2) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | tune-up power | | Gain | | | |
| | | | | (dBm) | (mW) | (dBi) | Numeric | | |
| 905.00 | GFSK | 7.62 | 7±1 | 8 | 6.310 | -2.00 | 0.63 | 0.0008 | 0.60 |
| 915.85 | GFSK | 6.17 | 7±1 | 8 | 6.310 | -2.00 | 0.63 | 0.0008 | 0.61 |
| 926.5 | GFSK | 6.62 | 7±1 | 8 | 6.310 | -2.00 | 0.63 | 0.0008 | 0.62 |

OCW=140KHz-wings

| Channel Freq. (MHz) | modulation | conducted power (dBm) | Tune-up power (dBm) | Max | | Antenna | | Evaluation result (mW/cm2 ) | Power density Limits (mW/cm2) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | tune-up power | | Gain | | | |
| | | | | (dBm) | (mW) | (dBi) | Numeric | | |
| 905.00 | GFSK | 7.85 | 7±1 | 8 | 6.310 | -2.00 | 0.63 | 0.0008 | 0.60 |
| 915.85 | GFSK | 6.91 | 7±1 | 8 | 6.310 | -2.00 | 0.63 | 0.0008 | 0.61 |
| 926.5 | GFSK | 6.07 | 7±1 | 8 | 6.310 | -2.00 | 0.63 | 0.0008 | 0.62 |

**Conclusion:**
For the max result : 0.0008≤ 0.60 for Max Power Density, compliance RF exposure..

Note: This product does not support simultaneous delivery.

**SIMULTANEOUS TRANSMISSIONS**

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE. To comply with the MPE, the fraction of the MPE in terms of $E^2$, $H^2$ (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity. In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^{n} \frac{S_i}{MPE_i} \leq 1$$

**SRD 24G**

Operation Frequency: GFSK: 24203MHz
Antenna Type: Antenna Type: Patch Antenna
Antenna gain: Antenna: 8 dBi
R=20cm

Transmit power:

| Frequency (MHz) | EIRP power (dBuV/m) | EIRP power (dBm) |
|---|---|---|
| 24203 | 104.6 | 9.34 |

EIRP=E-104.8+20log(D)
EIRP=conducted power + antenna gain

**Max. SIMULTANEOUS TRANSMISSIONS MODE**

| Band | | | | | MIMO | | Verdict |
|---|---|---|---|---|---|---|---|
| | Max Out power (dBm) | Separation distance (cm) | Evaluation result (mW/cm2 ) | Power density (mW/cm2) | Evaluation result | Power density Limits | |
| SRD 905+SRD 24G | 7.85 | 20 | 0.001213 | 0.6 | 0.003731 | 1 | PASS |
| | 9.34 | 20 | 0.001709 | 1 | | | |

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