# RF Exposure statement

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To whom it may concern:

TÜV SÜD Zacta is authorized as an agency from **Applicant: Yuyama Mfg. Co., Ltd.  (FCC ID: WSLFDX3, IC: 8213A-FDX3)** to act on their behalf in all matters relating to applications for equipment authorization, including testing the device and the signing of all documents relating to these matters.

## MAXIMUM PERMISSIBLE EXPOSURE

### FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—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

## IC RULES

IC RSS-102 Issue 5, Section 4 Exposure Limits, For the purpose of this standard, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6.

**Table 6: RF Field Strength Limits for Controlled Use Devices (Controlled Environment)**

| Frequency Range (MHz) | Electric Field (V/m rms) | Magnetic Field (A/m rms) | Power Density (W/m$^2$) | Reference Period (minutes) |
|---|---|---|---|---|
| 0.003-10$^{23}$ | 170 | 180 | - | Instantaneous* |
| 0.1-10 | - | 1.6/ $f$ | - | 6** |
| 1.29-10 | 193/ $f^{0.5}$ | - | - | 6** |
| 10-20 | 61.4 | 0.163 | 10 | 6 |
| 20-48 | 129.8/ $f^{0.25}$ | 0.3444/ $f^{0.25}$ | 44.72/ $f^{0.5}$ | 6 |
| 48-100 | 49.33 | 0.1309 | 6.455 | 6 |
| 100-6000 | 15.60 $f^{0.25}$ | 0.04138 $f^{0.25}$ | 0.6455$f^{0.5}$ | 6 |
| 6000-15000 | 137 | 0.364 | 50 | 6 |
| 15000-150000 | 137 | 0.364 | 50 | 616000/ $f^{1.2}$ |
| 150000-300000 | 0.354 $f^{0.5}$ | 9.40 x 10$^{-4}$ $f^{0.5}$ | 3.33 x 10$^{-4}$ $f$ | 616000/ $f^{1.2}$ |

**Note:** $f$ is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

## CALCULATIONS

Given

$$E = \sqrt{(30 * P * G)} / d$$

and

$$S = E ^ 2 / 3770$$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$$d = 0.282 * 10 ^ {((P + G) / 20)} / \sqrt{S}$$

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Rearranging terms to calculate the power density at a specific distance yields

$$S = 0.0795 * 10 ^ {((P + G) / 10)} / (d^2)$$

The power density in units of mW/cm^2 is converted to units of W/m^2 by multiplying by a factor of 10.

**LIMITS**

From FCC §1.1310 Table 1 (A), the maximum value of S = 900/(13.56)^2 = 4.9 mW/cm^2

From IC RSS-102 Issue 5, Section 4 Table 6, S = 10 W/m^2

**RESULTS**

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

(MPE distance is greater than 20 cm)

| Mode | Band | FCC Limit (mW/cm^2) | IC Limit (W/m^2) | Output (dBm) | Antenna (dBi) | MPE Distance (cm) |
|---|---|---|---|---|---|---|
| RFID | 13.56MHz | 4.9 | -10.0 | -101.10 | -59.17 | 30.0 |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |