



## Maximum Permissible Exposure (MPE) Calculations

MPE limit in 47CFR §1.1310

| Frequency range<br>(MHz)                                       | Electric field<br>strength<br>(V/m) | Magnetic field<br>strength<br>(A/m) | Power density<br>(mW/cm <sup>2</sup> ) | Averaging<br>time<br>(minutes) |
|----------------------------------------------------------------|-------------------------------------|-------------------------------------|----------------------------------------|--------------------------------|
| <b>(A) Limits for Occupational/Controlled Exposures</b>        |                                     |                                     |                                        |                                |
| 0.3–3.0                                                        | 614                                 | 1.63                                | *(100)                                 | 6                              |
| 3.0–30                                                         | 1842/f                              | 4.89/f                              | *(900/f <sup>2</sup> )                 | 6                              |
| 30–300                                                         | 61.4                                | 0.163                               | 1.0                                    | 6                              |
| 300–1500                                                       |                                     |                                     | f/300                                  | 6                              |
| 1500–100,000                                                   |                                     |                                     | 5                                      | 6                              |
| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                                     |                                     |                                        |                                |
| 0.3–1.34                                                       | 614                                 | 1.63                                | *(100)                                 | 30                             |
| 1.34–30                                                        | 824/f                               | 2.19/f                              | *(180/f <sup>2</sup> )                 | 30                             |
| 30–300                                                         | 27.5                                | 0.073                               | 0.2                                    | 30                             |
| 300–1500                                                       |                                     |                                     | f/1500                                 | 30                             |
| 1500–100,000                                                   |                                     |                                     | 1.0                                    | 30                             |

The Plane-wave equivalent power density can be calculated with the equation:

$$S = \frac{\text{EIRP}}{4 * \pi * R^2}$$

Where

|        |                                    |                    |
|--------|------------------------------------|--------------------|
| S =    | Power Density                      | mW/cm <sup>2</sup> |
| EIRP = | Effective isotropic radiated power | mW                 |
| R =    | Distance                           | cm                 |

From this equation we can calculate the safety distance needed to fulfil the MPE limits.

In these calculations we have assumed no feeder loss and a high directional antenna with 17dBi antenna gain at the installation.

|           |           | P                       | G                      | P+G           | EIRP          | S                    | R                          |
|-----------|-----------|-------------------------|------------------------|---------------|---------------|----------------------|----------------------------|
| Amplifier | Freq      | Output power to antenna | Antenna gain (typical) | TX Power EIRP | TX Power EIRP | Power density limit* | Calculated safety distance |
|           | (MHz)     | (dBm)                   | (dBi)                  | (dBm)         | (mW)          | (mW/cm2)             | (cm)                       |
| 700uC DL  | 746-758   | 41                      | 17                     | 58            | 631000        | 0,50                 | 316                        |
| 850 DL    | 869-894   | 41                      | 17                     | 58            | 631000        | 0,58                 | 294                        |
| 1900 DL   | 1930-1990 | 41                      | 17                     | 58            | 631000        | 1,00                 | 224                        |
| AWS DL    | 2110-2155 | 41                      | 17                     | 58            | 631000        | 1,00                 | 224                        |

\* Limit for General Population/Uncontrolled Exposure

No MPE calculations are needed for the Uplink paths in the EUT, because they are not radiated by an antenna. They are connected directly to the Base station.

Sincerely,



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