

## RF EXPOSURE EVALUATION

|                            |                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>           | MonstaTek llc                                                                                               |
| <b>Applicant Address</b>   | 99 SOUTH ALMADEN BLVD 600 San Jose US 95113<br>United States Of America (Excluding The States Of<br>Alaska) |
| <b>FCC ID</b>              | 2BSWU-M1                                                                                                    |
| <b>IC</b>                  | 34778-M1                                                                                                    |
| <b>Product Description</b> | MonstaTek M1                                                                                                |
| <b>Basic model(HVIN)</b>   | M1                                                                                                          |
| <b>Variant Model name</b>  | -                                                                                                           |
| <b>Operating Frequency</b> | 13.56 MHz, 125kHz,<br>304.50 MHz – 321.95 MHz,<br>433.075 MHz – 434.775 MHz,<br>915.0 MHz – 927.95 MHz      |
| <b>Antenna type</b>        | 125kHz_Coil Antenna,<br>1GHz Below_Helical antenna,<br>13.56MHz_PCB Antenna                                 |
| <b>Power Source</b>        | DC 3.7 V(Lithium Battery)                                                                                   |

## \*\* RF Exposure Evaluation \*\*

### Limits for FCC RF Exposure Evaluation

#### Determination of exemption (FCC Part 1, Subpart I, §1.1307 (b)(3))

(i) For single RF sources (*i.e.*, any single fixed RF source, mobile device, or portable device:

A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

### Limits for ISED RF Exposure Evaluation

#### Exemption Limits for Routine Evaluation(RSS-102, Section 2.5.1)

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

**Table 1: SAR evaluation - Exemption limits for routine evaluation based on frequency and separation distance**

| Frequency (MHz) | Exemption Limits (mW)           |                                 |                                 |                                 |                                 |
|-----------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|                 | At separation distance of ≤5 mm | At separation distance of 10 mm | At separation distance of 15 mm | At separation distance of 20 mm | At separation distance of 25 mm |
| ≤300            | 71 mW                           | 101 mW                          | 132 mW                          | 162 mW                          | 193 mW                          |
| 450             | 52 mW                           | 70 mW                           | 88 mW                           | 106 mW                          | 123 mW                          |
| 835             | 17 mW                           | 30 mW                           | 42 mW                           | 55 mW                           | 67 mW                           |
| 1900            | 7 mW                            | 10 mW                           | 18 mW                           | 34 mW                           | 60 mW                           |
| 2450            | 4 mW                            | 7 mW                            | 15 mW                           | 30 mW                           | 52 mW                           |
| 3500            | 2 mW                            | 6 mW                            | 16 mW                           | 32 mW                           | 55 mW                           |
| 5800            | 1 mW                            | 6 mW                            | 15 mW                           | 27 mW                           | 41 mW                           |

| Frequency (MHz) | Exemption Limits (mW)           |                                 |                                 |                                 |                                  |
|-----------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|
|                 | At separation distance of 30 mm | At separation distance of 35 mm | At separation distance of 40 mm | At separation distance of 45 mm | At separation distance of ≥50 mm |
| ≤300            | 223 mW                          | 254 mW                          | 284 mW                          | 315 mW                          | 345 mW                           |
| 450             | 141 mW                          | 159 mW                          | 177 mW                          | 195 mW                          | 213 mW                           |
| 835             | 80 mW                           | 92 mW                           | 105 mW                          | 117 mW                          | 130 mW                           |
| 1900            | 99 mW                           | 153 mW                          | 225 mW                          | 316 mW                          | 431 mW                           |
| 2450            | 83 mW                           | 123 mW                          | 173 mW                          | 235 mW                          | 309 mW                           |
| 3500            | 86 mW                           | 124 mW                          | 170 mW                          | 225 mW                          | 290 mW                           |
| 5800            | 56 mW                           | 71 mW                           | 85 mW                           | 97 mW                           | 106 mW                           |

## Calculation

$$P = \frac{P_t G_t}{4\pi r^2} = \frac{V^2}{Z_0} = \frac{E_{rms}^2}{120\pi}$$

Where  
 P = Electrical energy in watts  
 V = Voltage in V  
 Z<sub>0</sub> : Impedance in free space

$$E = \frac{\sqrt{30 P_t G_t}}{r} = \frac{\sqrt{30 EIRP(W)}}{r}$$

Where  
 P<sub>t</sub> = transmitter output power in watts  
 G<sub>t</sub> = numeric gain of the transmitting antenna (unitless)  
 E = electric field strength in V/m  
 r = measurement distance in meters (m)

$$20\log(E) = 10\log(30) + 10\log(EIRP) - 20\log(r)$$

$$E(\text{dBV}) = EIRP(\text{dBW}) - 20\log(r) + 14.77$$

$$EIRP(\text{dBm}) = E(\text{dBuV}) + 20\log(r) - 104.77$$

**Evaluation results** : SAR test is exempt as shown in the table below.

| Mode        | Frequency [MHz] | Measured power (dBuV/m@3m) | Maximum power |           | FCC Exemption | ISED Exemption |
|-------------|-----------------|----------------------------|---------------|-----------|---------------|----------------|
|             |                 |                            | [dBm]         | [mW]      |               |                |
| RFID        | 13.56           | 61.80                      | -33.43        | 0.000 454 | Below 1 mW    | Below 71 mW*   |
| 125kHz      | 0.125           | 65.10                      | -30.13        | 0.000 970 | Below 1 mW    | Below 71 mW*   |
| 300MHz Band | 321.95          | 64.60                      | -30.63        | 0.000 865 | Below 1 mW    | Below 52 mW*   |
| 400MHz Band | 434.875         | 75.20                      | -20.03        | 0.009 931 | Below 1 mW    | Below 52 mW*   |
| 900MHz Band | 915.0           | 72.20                      | -23.03        | 0.004 977 | Below 1 mW    | Below 17 mW*   |

\* Safety distance : 5 mm