

## Maximum Permissible Exposure (MPE) & Exposure evaluation

**Report identification number: 1-1248/16-01-15-A**

| Certification numbers and labeling requirements |                     |
|-------------------------------------------------|---------------------|
| FCC ID                                          | DMOADNWD            |
| IC number                                       | 2099A-ADNWD         |
| HVIN (Hardware Version Identification Number)   | ADN-W C1 / ADN-W D1 |
| PMN (Product Marketing Name)                    | ADN-W C1 / ADN-W D1 |
| FVIN (Firmware Version Identification Number)   | 1.2.0.6             |
| HMN (Host Marketing Name)                       | -/-                 |

Version A: 2.4 GHz results from project 1-3791/15-01 added, and values corrected

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures the public keys can be requested at the testing laboratory.

### Document authorized:



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### EUT technologies:

| Technologies: | Max. power:<br>(rounded up worst case<br>measured result) | Max. gain:<br>(measured) | Min. pathloss: |
|---------------|-----------------------------------------------------------|--------------------------|----------------|
| OFDM 2.4 GHz  | 11.5 dBm                                                  | 5.8 dBi                  | N/A            |
| OFDM 5.2 GHz  | 10.5 dBm                                                  | 4.9 dBi                  | N/A            |
| OFDM 5.3 GHz  | 10.5 dBm                                                  | 4.9 dBi                  | N/A            |
| OFDM 5.7 GHz  | 11.5 dBm                                                  | 3.7 dBi                  | N/A            |
| OFDM 5.8 GHz  | 11 dBm                                                    | 7.1 dBi                  | N/A            |

### Prediction of MPE limit at given distance - FCC

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2 \text{ or } S = EIRP/4\pi R^2$$

where: S = Power density  
P = Power input to the antenna  
G = Antenna gain  
R = Distance to the center of radiation of the antenna

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled "Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure"

| Frequency Range (MHz) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minutes) |
|-----------------------|-------------------------------------|--------------------------|
| 300 -1500             | f/1500                              | 30                       |
| 1500 - 100000         | 1.0                                 | 30                       |

where f = Frequency (MHz)

### Prediction: worst case

|   |                                      | > 1500 MHz                     | > 1500 MHz                     | > 1500 MHz                     | > 1500 MHz                     | > 1500 MHz                     |
|---|--------------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
|   | Technology                           | OFDM 2.4 GHz                   | OFDM 5.2 GHz                   | OFDM 5.3 GHz                   | OFDM 5.7 GHz                   | OFDM 5.8 GHz                   |
| P | Max power input to the antenna [dBm] | 11.5 dBm                       | 10.5 dBm                       | 10.5 dBm                       | 11.5 dBm                       | 11 dBm                         |
| R | Distance [cm]                        | 20 cm                          | 20 cm                          | 20 cm                          | 20 cm                          | 20 cm                          |
| G | Antenna gain [dBi]                   | 5.8 dBi                        | 4.9 dBi                        | 4.9 dBi                        | 3.7 dBi                        | 7.1 dBi                        |
| S | MPE limit for uncontrolled exposure  | 1 mW/cm <sup>2</sup>           | 1 mW/cm <sup>2</sup>           | 1 mW/cm <sup>2</sup>           | 1 mW/cm <sup>2</sup>           | 1 mW/cm <sup>2</sup>           |
|   | <b>Calculated Power density:</b>     | <b>0.011 mW/cm<sup>2</sup></b> | <b>0.007 mW/cm<sup>2</sup></b> | <b>0.007 mW/cm<sup>2</sup></b> | <b>0.007 mW/cm<sup>2</sup></b> | <b>0.012 mW/cm<sup>2</sup></b> |
|   | <b>Percent of MPE limit</b>          | <b>1.05 %</b>                  | <b>0.7 %</b>                   | <b>0.7 %</b>                   | <b>0.65 %</b>                  | <b>1.25 %</b>                  |

**This prediction demonstrates the following:**

The power density levels for FCC at a distance of 20 cm are below the maximum levels allowed by regulations.

### Prediction of MPE limit at given distance - IC

RSS-102, Issue 5, 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

### Prediction: worst case

|   | Technology                          | OFDM 2.4 GHz  | OFDM 5.2 GHz   | OFDM 5.3 GHz   | OFDM 5.7 GHz   | OFDM 5.8 GHz   |
|---|-------------------------------------|---------------|----------------|----------------|----------------|----------------|
| P | Max power input to the antenna      | 11.5 dBm      | 10.5 dBm       | 10.5 dBm       | 10.5 dBm       | 11 dBm         |
| G | Antenna gain                        | 5.8 dBi       | 4.9 dBi        | 4.9 dBi        | 3.7 dBi        | 7.1 dBi        |
| S | MPE limit for uncontrolled exposure | 2.7 W         | 4.54 W         | 4.57 W         | 4.70 W         | 4.89 W         |
|   | <b>Calculated output power:</b>     | <b>54 mW</b>  | <b>38.1 mW</b> | <b>34.6 mW</b> | <b>33.0 mW</b> | <b>64.4 mW</b> |
|   | <b>Percent of MPE limit</b>         | <b>1.98 %</b> | <b>0.76 %</b>  | <b>0.75 %</b>  | <b>0.7 %</b>   | <b>1.32 %</b>  |

**Conclusion:** for applications where minimum distance to radiating element is 20cm Annex C of RSS-102 should be filled out.