

# Prediction of MPE

## 1. Declaration of RF exposure compliance for exemption from routine evaluation limits

|                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Applicant:                                           | Multiplex Modellsport GmbH & Co. KG<br>Westliche Gewerbestr. 1<br>75015 Bretten-Gölshausen<br>Germany                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
| Nemko ident. no.:                                    | 359040                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
| Number of pages:                                     | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |
| Product                                              | Radio Data Modem                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
| Model name:                                          | QBaseModem                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| FCC ID:                                              | 2APABQBASE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| Manufacturer:                                        | Multiplex Modellsport GmbH & Co. KG<br>Westliche Gewerbestr. 1<br>75015 Bretten-Gölshausen<br>Germany                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
| Exposure Conditions:                                 | <p>The EUT is a transceiver, operating in the 915 MHz band. It is designed for high performance data transmission over long distances. The EUT uses a standard TTL UART interface for Data communication.</p> <p>The EUT can be soldered onto two different supporting PCBs for Air modem and Ground modem. A voltage regulator 5V dc to 3.3V dc, interface connector and RF connector is located on each supporting PCB. Communication is bi-directional.</p> <p>The air modem is used in drones at the air, which are normally in a distance of more than 20cm from the human body</p> <p>The ground modem is used together with a computer at the ground, but have a separate antenna with a 1.5m cable length. Also the distance of the antenna to the human body is normally more than 20cm</p>                                                                                                                                                                                                                                                                                                                                                                           |  |  |
| 4.3.1. Standalone SAR test exclusion considerations: | <div> <div>  <p><b>Prediction of MPE limit at a given distance</b></p> <p>Equation from page 18 of OET Bulletin 65, Edition 97-01</p> <math display="block">S = \frac{PG}{4\pi R^2}</math> <p>where: S = power density<br/>P = power input to the antenna<br/>G = power gain of the antenna in the direction of interest relative to isotropic radiator<br/>R = distance to the center of radiation of the antenna</p> </div> <div> <p>Maximum peak output power at antenna input terminal: 24.3 dBm</p> <p>Maximum peak output power at antenna input terminal: 269.2 mW</p> <p>Antenna gain(maximum): 6.2 dBi</p> <p>Maximum antenna gain: 4.2 numeric</p> <p>Time Averaging: 100 %</p> <p>Prediction distance: 20 cm</p> <p>Prediction frequency: 903 MHz</p> <p>FCC MPE limit for uncontrolled exposure at prediction frequency: 0.60 mW/cm<sup>2</sup></p> <p>IC MPE limit for uncontrolled exposure at prediction frequency: 2.74 W/m<sup>2</sup></p> <p>Power density at prediction frequency: 0.22 mW/cm<sup>2</sup></p> <p>This equates to: 2.23 W/m<sup>2</sup></p> </div> </div> |  |  |

## Calculation for Ground Modem



### Prediction of MPE limit at a given distance

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

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density  
P = power input to the antenna  
G = power gain of the antenna in the direction of interest relative to isotropic radiator  
R = distance to the center of radiation of the antenna

|                                                |                                                                  |       |                    |
|------------------------------------------------|------------------------------------------------------------------|-------|--------------------|
| PWR in dBm                                     | Maximum peak output power at antenna input terminal:             | 20.4  | dBm                |
|                                                | Maximum peak output power at antenna input terminal:             | 109.1 | mW                 |
| Ant. gain in dBi                               | Antenna gain(maximum):                                           | 3.8   | dBi                |
|                                                | Maximum antenna gain:                                            | 2.4   | numeric            |
| Use the duty cycle from test report or 100%    | Time Averaging:                                                  | 100   | %                  |
| Separation distance from antenna to user in cm | Prediction distance:                                             | 20    | cm                 |
| Freq. in MHz                                   | Prediction frequency:                                            | 903   | MHz                |
|                                                | FCC MPE limit for uncontrolled exposure at prediction frequency: | 0.60  | mW/cm <sup>2</sup> |
|                                                | IC MPE limit for uncontrolled exposure at prediction frequency:  | 2.74  | W/m <sup>2</sup>   |
|                                                | Power density at prediction frequency:                           | 0.05  | mW/cm <sup>2</sup> |
|                                                | This equates to:                                                 | 0.52  | W/m <sup>2</sup>   |

## 2. Attestation

ATTESTATION: I attest that the testing was performed by a FCC listed test laboratory, that the test measurements were made in accordance with the above-mentioned departmental standard(s), and that the radio equipment identified in this application has been subject to all applicable test conditions specified in the departmental standards and all of the requirements of the standards have been met.

|            |                                                                                     |
|------------|-------------------------------------------------------------------------------------|
| Signature: |  |
| Date:      | March 5, 2020                                                                       |
| Name:      | Peter Lukas, Lab Manager                                                            |