

**30<sup>th</sup> September 2013**

**UL VS Ltd  
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**RE: 2.5GHz PCI Express Mini Module FCC ID: PKTPEMAAU2 MPE Calculation**

To Whom It May Concern,

The General Dynamics Broadband PCI Express Mini Module is considered to be mobile equipment and intended for operation with a minimum separation gap of 20cm between the user and the equipment, therefore the RF Exposure performance can be assessed by a Maximum Permissible Exposure (MPE) calculation.

The General Dynamics Broadband PCI Express Mini module uses time division duplex (TDD) technology in normal operation with a maximum transmitter duty cycle of 80%, therefore source based averaging can be applied in the MPE calculation.

| <b>MPE Distance Calculation</b>            | 5.5MHz Channel |                    | 11MHz Channel |                    |
|--|----------------|--------------------|---------------|--------------------|
| Antenna Gain                               | 8.5            | dBi                | 8.5           | dBi                |
| Line Loss                                  | 0              | dB                 | 0             | dB                 |
| Antenna Gain Ratio                         | 7.079457844    |                    | 7.079458      |                    |
| PCIe Mini Module Model AAU Tx Output Power | 24             | dBm                | 24            | dBm                |
| Upper Tolerance on Transmit Power          | 0.5            | dB                 | 0.5           | dB                 |
| Output Power mW                            | 281.84         | mW                 | 281.84        | mW                 |
| Maximum EIRP (per Channel)                 | 1995.26        | mW                 | 1995.26       | mW                 |
| MPE Limit from 1.1310                      | 1              | mw/cm <sup>2</sup> | 1             | mw/cm <sup>2</sup> |
| Un-controlled/General Public Limit         |                |                    |               |                    |
| <b>Minimum Distance to meet MPE Limit</b>  | <b>12.60</b>   | <b>cm</b>          | <b>12.60</b>  | <b>cm</b>          |
| (100% Duty Cycle)                          | <b>4.96</b>    | <b>inches</b>      | <b>4.96</b>   | <b>inches</b>      |

**Table 1: 100% Duty Cycle Calculation**

| <b>Sourced Based Duty Cycle Adjustment</b>  |              |               |              |               |
|---|--------------|---------------|--------------|---------------|
| Total Timeslots in Frame                    | 15           |               | 15           |               |
| Timeslots for Transmit                      | 12           |               | 12           |               |
| Timeslots for Receive                       | 10           |               | 10           |               |
| Percentage time transmitting in Tx timeslot | 100          | %             | 100          | %             |
| Power Control Attenuation                   | 0            | dB            | 0            | dB            |
| Duty Cycle Correction Factor                | 80.00        | %             | 80.00        | %             |
| <b>Minimum Distance to meet MPE Limit</b>   | <b>11.27</b> | <b>cm</b>     | <b>11.27</b> | <b>cm</b>     |
| (33.33% Duty Cycle)                         | <b>4.43</b>  | <b>inches</b> | <b>4.43</b>  | <b>inches</b> |

**Table 2: Source Based Averaging Calculation**

The calculations above show the 2.5GHz PCI Express Mini Module FCC ID: PKTPEMAAU2 complies with the un-controlled /General Public exposure limit of  $1\text{mW}/\text{cm}^2$  at a minimum distance of 11.3cm from the antenna for operation using either 5.5MHz or 11MHz channels.

Yours Faithfully



P Warburg  
Principal Engineer  
General Dynamics Broadband