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|   | PDI 9m Ka-Band Gateway for<br>Aurora-4A<br>Addendum to Antenna Range<br>Report<br>Eagle Mountain, UT, USA |          |          |       |
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## 1 INTRODUCTION

The following document presents additional Antenna Gain related information for the 9.4m Ka-Band antenna.



Figure 1-1: 9.4m Monopulse Antenna – Typical Installation

This technical note is to be read in conjunction with the KRATOS Space Antenna and RF Solution (ex-ASC Signal) report dated 5<sup>th</sup> December 2017 *“Range Test Report, ASC 9.4m Ka Band Antenna”*.

In order to support Pacific Dataport Inc. License application, KRATOS derived the antenna gain from the values available in the range report at each frequency (per MHz), in the following range:

- Rx: 17.7 – 20.2 GHz
- Tx: 27.5 – 30.0 GHz

## 2 METHOD

The Range report shows the following Antenna gain at specific frequencies:

|                 |       |       |       |       |       |       |
|-----------------|-------|-------|-------|-------|-------|-------|
| Frequency (MHz) | 17700 | 18950 | 19450 | 20200 | 20700 | 21200 |
| Gain (dBi)      | 61.79 | 62.64 | 62.95 | 63.34 | 63.62 | 63.74 |

|                 |       |       |       |       |       |       |
|-----------------|-------|-------|-------|-------|-------|-------|
| Frequency (MHz) | 27500 | 28750 | 29250 | 30000 | 30500 | 31000 |
| Gain (dBi)      | 65.81 | 65.90 | 66.25 | 66.29 | 66.39 | 66.24 |

These antenna gains are calculated by integrating the antenna pattern measurement.

It is known that the antenna gain follows a logarithmic trend and can be estimated with the following formula:

$$G_{F_1} = G_{F_0} + 20 * \log_{10} \frac{F_1}{F_0}$$

So using best-fit curves, we obtain the following results (considering the number of points, results are shown in 50 MHz interval, for 1 MHz interval please refer to Excel spreadsheet provided).

## 2.1 RX GAIN RESULTS

| <u>Frequency (GHz)</u> | <u>Gain (dBi)</u> |  | <u>Frequency (GHz)</u> | <u>Gain (dBi)</u> |
|------------------------|-------------------|--|------------------------|-------------------|
| 17.7                   | 61.79             |  | 19.6                   | 63.03             |
| 17.75                  | 61.82             |  | 19.65                  | 63.06             |
| 17.8                   | 61.86             |  | 19.7                   | 63.08             |
| 17.85                  | 61.89             |  | 19.75                  | 63.11             |
| 17.9                   | 61.93             |  | 19.8                   | 63.13             |
| 17.95                  | 61.96             |  | 19.85                  | 63.16             |
| 18                     | 62.00             |  | 19.9                   | 63.19             |
| 18.05                  | 62.03             |  | 19.95                  | 63.21             |
| 18.1                   | 62.07             |  | 20                     | 63.24             |
| 18.15                  | 62.10             |  | 20.05                  | 63.26             |
| 18.2                   | 62.14             |  | 20.1                   | 63.29             |
| 18.25                  | 62.17             |  | 20.15                  | 63.32             |
| 18.3                   | 62.20             |  | 20.2                   | 63.34             |
| 18.35                  | 62.24             |  | 20.25                  | 63.37             |
| 18.4                   | 62.27             |  | 20.3                   | 63.40             |
| 18.45                  | 62.31             |  | 20.35                  | 63.42             |
| 18.5                   | 62.34             |  | 20.4                   | 63.45             |
| 18.55                  | 62.37             |  | 20.45                  | 63.48             |
| 18.6                   | 62.41             |  | 20.5                   | 63.51             |
| 18.65                  | 62.44             |  | 20.55                  | 63.54             |
| 18.7                   | 62.47             |  | 20.6                   | 63.56             |
| 18.75                  | 62.51             |  | 20.65                  | 63.59             |
| 18.8                   | 62.54             |  | 20.7                   | 63.62             |
| 18.85                  | 62.57             |  | 20.75                  | 63.63             |
| 18.9                   | 62.61             |  | 20.8                   | 63.64             |
| 18.95                  | 62.64             |  | 20.85                  | 63.66             |
| 19                     | 62.67             |  | 20.9                   | 63.67             |
| 19.05                  | 62.70             |  | 20.95                  | 63.68             |
| 19.1                   | 62.73             |  | 21                     | 63.69             |
| 19.15                  | 62.76             |  | 21.05                  | 63.70             |
| 19.2                   | 62.80             |  | 21.1                   | 63.72             |
| 19.25                  | 62.83             |  | 21.15                  | 63.73             |
| 19.3                   | 62.86             |  | 21.2                   | 63.74             |
| 19.35                  | 62.89             |  |                        |                   |
| 19.4                   | 62.92             |  |                        |                   |
| 19.45                  | 62.95             |  |                        |                   |
| 19.5                   | 62.98             |  |                        |                   |
| 19.55                  | 63.00             |  |                        |                   |

2.2 TX GAIN RESULTS

| <u>Frequency (GHz)</u> | <u>Gain (dBi)</u> |  | <u>Frequency (GHz)</u> | <u>Gain (dBi)</u> |
|------------------------|-------------------|--|------------------------|-------------------|
| 27.5                   | 65.81             |  | 29.4                   | 66.26             |
| 27.55                  | 65.81             |  | 29.45                  | 66.26             |
| 27.6                   | 65.82             |  | 29.5                   | 66.26             |
| 27.65                  | 65.82             |  | 29.55                  | 66.27             |
| 27.7                   | 65.82             |  | 29.6                   | 66.27             |
| 27.75                  | 65.83             |  | 29.65                  | 66.27             |
| 27.8                   | 65.83             |  | 29.7                   | 66.27             |
| 27.85                  | 65.84             |  | 29.75                  | 66.28             |
| 27.9                   | 65.84             |  | 29.8                   | 66.28             |
| 27.95                  | 65.84             |  | 29.85                  | 66.28             |
| 28                     | 65.85             |  | 29.9                   | 66.28             |
| 28.05                  | 65.85             |  | 29.95                  | 66.29             |
| 28.1                   | 65.85             |  | 30                     | 66.29             |
| 28.15                  | 65.86             |  |                        |                   |
| 28.2                   | 65.86             |  |                        |                   |
| 28.25                  | 65.86             |  |                        |                   |
| 28.3                   | 65.87             |  |                        |                   |
| 28.35                  | 65.87             |  |                        |                   |
| 28.4                   | 65.88             |  |                        |                   |
| 28.45                  | 65.88             |  |                        |                   |
| 28.5                   | 65.88             |  |                        |                   |
| 28.55                  | 65.89             |  |                        |                   |
| 28.6                   | 65.89             |  |                        |                   |
| 28.65                  | 65.89             |  |                        |                   |
| 28.7                   | 65.90             |  |                        |                   |
| 28.75                  | 65.90             |  |                        |                   |
| 28.8                   | 65.93             |  |                        |                   |
| 28.85                  | 65.97             |  |                        |                   |
| 28.9                   | 66.00             |  |                        |                   |
| 28.95                  | 66.04             |  |                        |                   |
| 29                     | 66.07             |  |                        |                   |
| 29.05                  | 66.11             |  |                        |                   |
| 29.1                   | 66.14             |  |                        |                   |
| 29.15                  | 66.18             |  |                        |                   |
| 29.2                   | 66.21             |  |                        |                   |
| 29.25                  | 66.25             |  |                        |                   |
| 29.3                   | 66.25             |  |                        |                   |
| 29.35                  | 66.25             |  |                        |                   |