Estimating Distance and Calculating DAS

Estimating distance from Antenna 1 and Antenna 2 to object using time delay

A piece of paper with writing on it

Description automatically generated with medium confidence

*fig 1: sketch showing the distance between the two antennas and an object in between*

Chart

Description automatically generated

*fig 2: plot of the ranging data showing the input signal, response from antenna 1 and response from antenna 2*

From analysis of the ranging data, it appears that all three signals are identical and symmetrical. To determine the time delay between the input signal and response of both antennas, a point along the input signal is chosen where the pulse appears to start. The magnitude at this point is repeated in the response of both antennas. The time at which this magnitude occurred for all three signals is recorded.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Magnitude** | **Time (s)** | **Cell number** |
| **Input Signal** | 0.00010008 | 4.77x10-10 | 4773 |
| **Antenna 1 Response** | 0.00010008 | 4.48x10-9 | 44773 |
| **Antenna 2 Response** | 0.00010008 | 7.48x10-9 | 74773 |

To calculate the time delay for each antenna, the input signal time is subtracted from the antenna response times at this magnitude:

Time delay Antenna 1:

Time delay Antenna 2:

The distance between the antennas and the object is calculated using d = s x t where s = 3x108 m/s.

Distance from Antenna 1 to object and back:

Distance from Antenna 2 to object and back:

The distance from the object to both antennas is half the distance calculated above, Therefore:

* Distance from Antenna 1 to object = 0.60045 m
* Distance from Antenna 2 to object = 1.05045 m

Diagram, schematic

Description automatically generated

*fig 3: sketch of the scene – antennas in relation to object*