The Design and Performance of the Zephyr Geodetic Antenna (Trimble publication)

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THE DESIGN AND PERFORMANCE OF THE ZEPHYR GEODETIC ANTENNA

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ABSTRACT

The Trimble Zephyr Geodetic Antenna is a new highperformance GPS antenna utilizing two key technological innovations, for which US patents 5,515,057 and 5,694,136 have been issued to Trimble Navigation Ltd. This paper explains these GPS antenna technologies, their advantages and presents the results of performance testing on this new antenna design.

The n-point antenna feed technology is described. This is designed to reduce the electrical phase center error ellipsoid through enhanced antenna element and feed point pattern symmetry. This symmetry is also designed to improve the Right Hand Circular Polarization Characteristics of the antenna, resulting in enhanced GPS signal tracking and improved multipath rejection in cases where a polarization reversal has taken place as a result of the signal reflection.

The second key technology described is that utilized in the Trimble Stealth Ground Plane, an integral component of the Zephyr Geodetic Antenna. Conventional GPS ground planes typically use one of two designs; the circular metal ground plane or the choke ring ground plane. The method used for the Trimble Stealth Ground Plane is one whereby the e-field of the electromagnetic wave is cut off before it can reach the GPS antenna element. This is achieved through the use of a material in which the sheet resistivity increases exponentially along any radial line out from the antenna element to the edge of the ground plane. The use of this material offers the advantages of lighter weight and lower cost over conventional ground plane designs. As the name suggests, the material was developed out of research conducted as part of the development of the Stealth aircraft.

This method is frequency independent at L-band, so is expected to be equally effective at the L1 and L2 frequencies. This property also offers a potential advantage in future triple-frequency antennas capable of tracking L1, L2 and L5 signals, with the ability to reject multipath equally effectively at all three frequencies.

In order to test the performance of the new design, a number of tests were carried out with well known designs such as the choke ring used as a control. The results of these tests, including low and high elevation tracking performance, code and carrier phase multipath rejection, phase center repeatability and positioning precision are presented. Physical characteristics such as size and weight are also compared.

[See attached .pdf file for more.]

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