

Frisbee Antenna: a Robust, Compact and Reconfigurable Antenna Design Concept

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The process of antenna design and development is often limited to the realization of an antenna that is based on the physical constraints such as size, volume, and the desired electrical performance characteristics. During this process, the mechanical and ergonomic design features of the antenna and its finished form factor are rarely given much importance from the very beginning. Contrary to this trend, the antenna systems employed in the field for applications such as sensing, telemetry and electronic warfare demand a higher level of structural integrity and robustness over a long period of time along with its compliance to the desired performance characteristics. The herein proposed Frisbee Antenna concept addresses this issue by encasing a standard planar antenna within a low cost and robust protective casing constructed using a pair of frisbee discs and mounting fixtures. In this paper we present the design process involved in the development of the frisbee antenna. The antenna is comprised of a circular log periodic aperture that is designed with respect to a standard set of parameters such as maximum diameter, substrate thickness, mounting hole patterns and provisions for placement of the antenna elements and connector in order to integrate the antenna aperture compactly within the frisbee housing. The housing itself is comprised of a pair of frisbee discs, polycarbonate mounting lugs and mounting fixtures. The complete computational study of the antenna with and without the frisbee housing is presented. The results, including measurements, show that the frisbee housing does not have any negative impacts on the antenna performance. It is however observed that the housing actually improves the electrical performance of the antenna to a slight degree due to loading effects. The additional utilities provided for the antenna aperture by the sealed housing such as ruggedness, water resistance, dust, moisture and weather protection are also discussed in the paper. The concluding section of the paper highlights the reconfigurable nature of the frisbee antenna concept and discusses about the potential applications and future developments. The reconfigurable nature of the frisbee antenna aims at using the same housing for mounting different antenna apertures such as spirals, sinuous and other planar designs by fabricating the apertures with compliance to the described set of design parameters. The discussion about the future improvisations for the concept includes the realization of an easy to mount and dismount type of housing with the use of a magnetic mounting assembly for the aperture placed inside the frisbee housing.