Knowledge Transfer Office
香港城市大學
City University of Hong Kong

3-D-Printed Wideband High-Gain Circularly Polarized Dielectric Resonator Antenna

Communications & Information

Manufacturing

Digital Broadcasting, Telecommunication and Optoelectronics

Opportunity

The current technological landscape involves extensive use of circular polarized (CP) dielectric resonator antennas (DRAs) in wireless communication systems due to their compact size, flexibility in application and absence of conduction losses. Within this domain, the issue of complexity surrounding multi-fed CP DRAs has been addressed using single-fed antennas, but at the cost of substantially narrowing the axial ratio (AR) bandwidth. Efforts to broaden this bandwidth using irregular geometries, while successful, are associated with low broadside antenna gain and difficulty in assembly. Another limitation lies in the manufacturing process of these antennas – conventional mechanical approaches are time consuming and costly. The advent of 3-D-printing techniques presents a powerful opportunity to improve both the performance and manufacture of these antennas.

Technology

The invention presents a single-fed, wideband circularly-polarized dielectric resonator antenna, which incorporates extraordinary design elements to seamlessly overcome the limitations of current antennas. Most importantly, the antenna is devised with a lower portion configured as a twisted inverted-frustum and an upper portion consisting of plural interleaved slabs of varying dielectric constants. This innovative design enhances the axial ratio bandwidth, thereby addressing one of the key hurdles of single-fed antennas. Another critical aspect is the use of 3-D printing technology in the fabrication process, which overcomes the drawbacks of conventional manufacturing methods such as high-cost, time-consuming practices, effectively leading to a more efficient and versatile production methodology.

Advantages

- The inventive antenna architecture significantly broadens the axial ratio bandwidth, enhancing the performance of single-fed designs.
- The use of 3-D printing technology in fabricating the antennas reduces manufacturing time and cuts costs.
- Associated production with 3-D printing also allows for a more flexible design implementation, improving antenna attributes.

IP Status
Patent granted

Technology Readiness Level (TRL) ? 5

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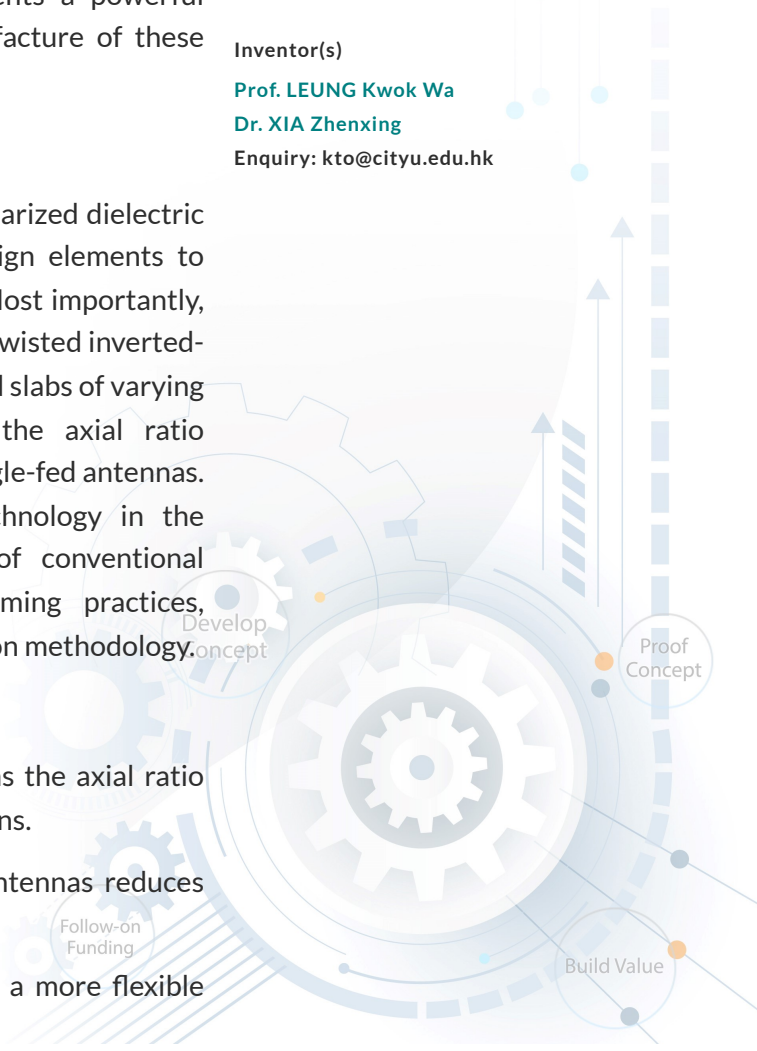

- The compounded fabrication methodology ensures a more eco-friendly manufacturing process.
- The configuration of this antenna design alleviates limitations of assembly associated with multi-layered DRAs.

Applications

- The antennas can be incorporated extensively within the wireless communication systems for robust connectivity.
- Use in telecommunications sector for networks requiring wider axial ratio bandwidths.
- Application in satellite and space communications, where broad bandwidths and flexible orientation are critical.
- The antennas can be utilized in remote sensing operations, specifically those requiring wideband communications.
- Beneficial in sectors requiring portable, compact antenna systems with high performance capabilities.