

# 3D-printed Broad-beam Dielectric Resonator Antenna



Communications & Information

Digital Broadcasting, Telecommunication and Optoelectronics

Others

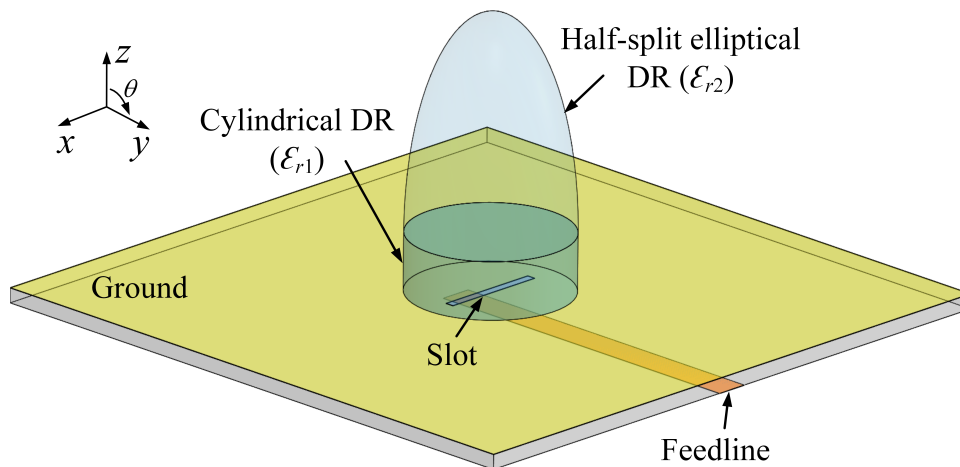


Fig. 1: Configuration of broad-beam DRA. (Perspective view).

## Opportunity

Broad-beam antennas have the potential to realize phased antenna array with wide-angle beam scanning. Current designs suffer complex dc biasing circuits, which will result in low radiation efficiencies. The invention presents a Dielectric resonator (DR) antenna (DRA) with wide 3 dB beamwidths in both E-plane and H-plane. Also, a large planar ground plane of  $2\lambda_0 \times 2\lambda_0$  is used, where  $\lambda_0$  is the wavelength in air at the center frequency of the operation band. DRA designs with wide beamwidths in both E and H planes generally require a small or conformal ground plane, but for phased antenna arrays, large flat ground plane is required. With this invention, various attractive features over the existing designs such as its compact size, high radiation efficiency, and ease of excitation have been realized. Also the invention proposes a broadband DRA that can be conveniently fabricated in one go by using 3D printing techniques. This new design will improve quality of service in a complex electromagnetic environment. It can also be integrated into an antenna array.

## Technology

A dielectric resonator antenna (DRA) and a dielectric resonator antenna array are proposed here. The DRA includes a ground plane, a dielectric resonator element, and a feed network. When excited, the DRA can provide wide half-power beam-widths in both E- and H-planes. It has two portions only, which can be fabricated easily in one go by using a 3-D dielectric printer.

### IP Status

Patent granted



Technology Readiness Level (TRL) ?

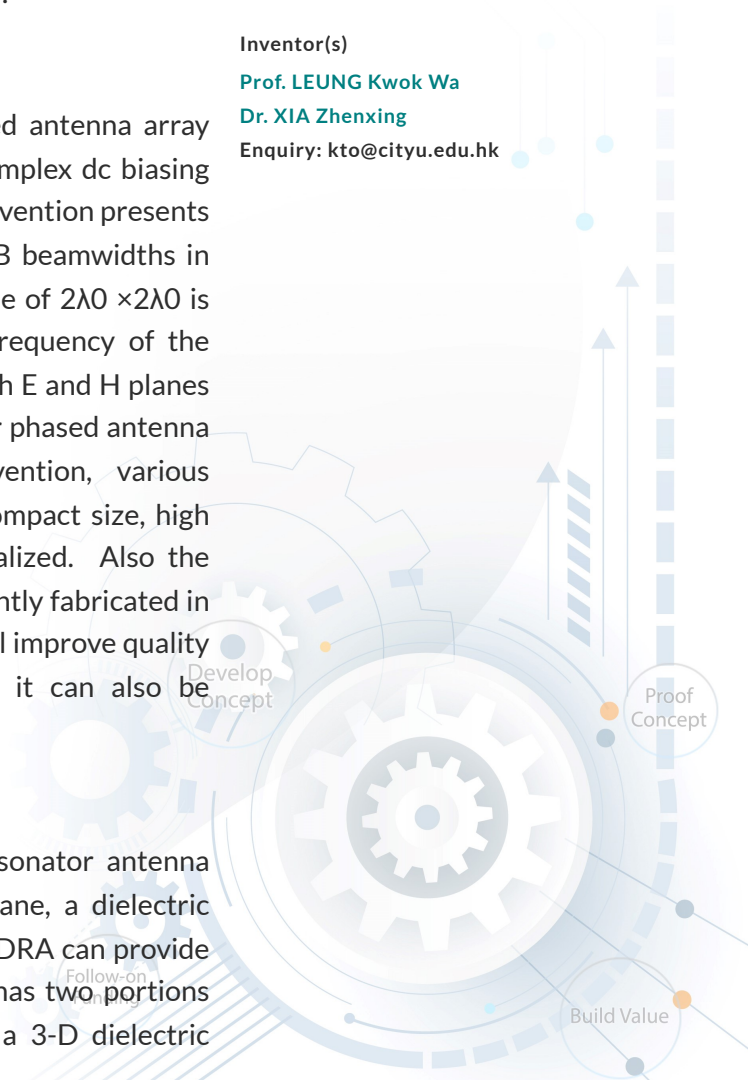
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## Advantages

- The proposed DRA has wide 3 dB beamwidths in both E- and H-planes just by using the DR itself only. Hence, the overall size and design complexity are reduced.
- The invention can be easily applied to antenna array designs, especially for wide-angle beam scanning phased antenna array due to its compact footprint size and simple feeding network.
- This invention can be cost-effectively fabricated in one go by 3D printing approaches.
- With 3D printing methods, any reasonable shapes and combinations of materials with different dielectric constants can be utilized, allowing the radiation pattern of the proposed design be customized to any desired and reasonable shapes, making the design flexible for different scenarios.

## Applications

- Invention can be used in a phased antenna array to realize wide-angle beam scanning. It will be very useful for increasing the scanning range of a beamforming antenna array. Especially, its antenna array can be applied to recently launched 5G wireless communication networks.

