

Dual-fed Dual-frequency Hollow Dielectric Antenna

Communications & Information

Manufacturing

Computer/AI/Data Processing and Information Technology

Digital Broadcasting, Telecommunication and Optoelectronics

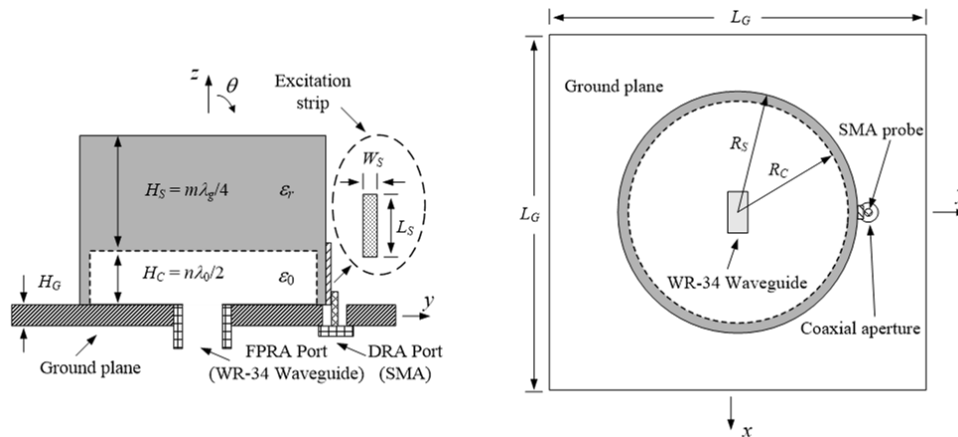


Figure 1. Configuration of the proposed dual-frequency antenna. (Side view and Top view)

IP Status
Patent granted

Technology Readiness Level (TRL) ?

4

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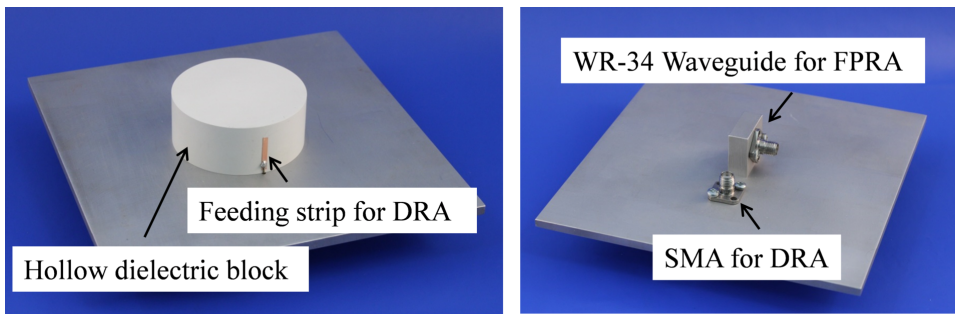
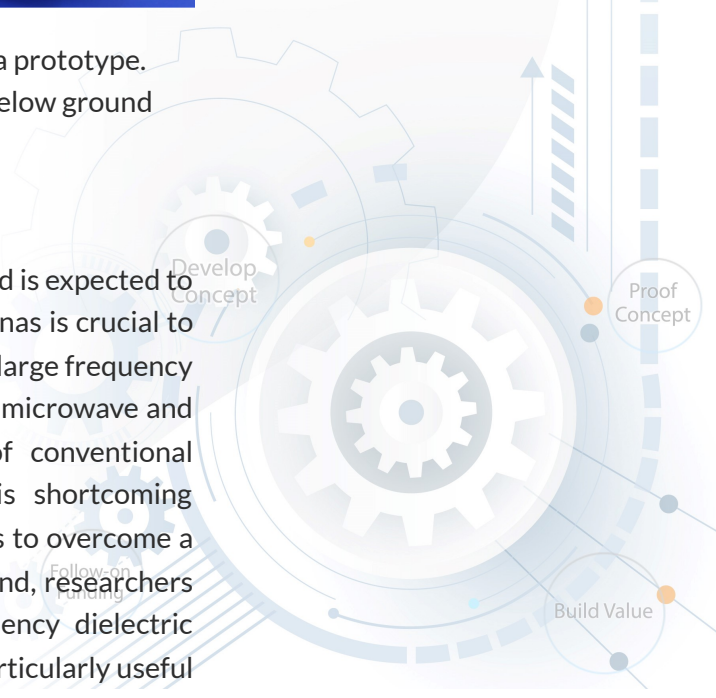


Figure 2. Photo of fabricated dual-fed dual-frequency antenna prototype. (Left) Perspective view of antenna. (Right) Perspective view below ground plane.

Opportunity

The market for wireless systems is worth billions of dollars and is expected to continue expanding. Increasing the frequency ratios of antennas is crucial to improve the performance of wireless systems. In particular, a large frequency ratio is needed when a system is required to operate in both microwave and millimeter-wave bands. However, the frequency ratios of conventional single-fed dual-frequency antennas are very limited. This shortcoming presents a huge opportunity to improve on existing antennas to overcome a bottleneck in the development of wireless systems. To this end, researchers have developed a novel and compact dual-fed dual-frequency dielectric antenna system with a large frequency ratio, which will be particularly useful in dual-frequency radar and wireless communication applications.



Technology

The new dual-fed dual-frequency antenna system has a simple and innovative fabrication method: a microwave antenna and a millimeter-wave antenna are compactly integrated in a single hollow dielectric block. The block serves as both the resonator for the microwave antenna and the superstrate for the millimeter-wave antenna. The two antennas are excited simultaneously but at different frequencies via two ports on the block. The resonant frequencies of the two antennas can be determined independently, making it easy to achieve a large frequency ratio. Tests show that the new antenna system offers high efficiency for both antenna types. The millimeter-wave antenna attains an efficiency as high as 87.3% at 24 GHz.

Advantages

- As the new antenna system is compactly integrated in a single hollow dielectric block, it is much smaller and lighter than existing dual-fed dual-frequency antenna systems, which have separate radiators for different frequency bands.
- The novel millimeter-wave antenna improves on conventional antennas of this type by using the side wall of the hollow block instead of spacers (e.g. foam) to support the dielectric superstrate.

Applications

- Applications in the rapidly evolving field of mobile and satellite communication in the 5G era and beyond, especially the development of dual-frequency radar and wireless communication systems.

