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Low-Profile, Wideband and High Gain Spiral Antenna above an AMC Ground Plane

High Impedance Surfaces (HIS) are one of the breakthroughs that emerged in the modern antenna design area in 1999. HISs are ideal candidates as antenna ground planes because of their near perfect magnetic ground conductor (PMC) behavior at particular ranges. However, current rectangular designs have a limited performance and lack efficiency in the current antenna industry. Therefore, there is a need for an improved HIS design that accommodates higher operational bandwidths and overall directivity and electrical efficiency.

Researchers at Arizona State University have developed a spiral antenna using a circularly symmetric HIS. This innovation has a significantly better performance than rectangular HISs when used as ground plans for loop radiating elements.

Spiral-shaped antennas have an advantage mainly due to the electric fields radiated interact more effectively and efficiently due to its curvature and symmetry. This design has both a wider fractional and operational bandwidth and contains more symmetric gain patterns. The ground plane from this design produces a higher 3 dB gain in comparison due to the reflection phase profile.

Potential Applications

- Advanced airborne vehicles
- Unmanned aircraft systems
- Clandestine ground units
- Radio signal systems

Benefits and Advantages

- Low-profile Antenna – Low radar signature makes this technology suitable for vehicles with low radar visibility.
- Circular periodicity – Provided 16 and 11.3 percent greater operational and fractional bandwidths, respectively.
- Circular HIS Ground Plane – The reflection phase profile of this antenna causes elemental waves to emit in a radial direction, increasing the gain by 3 dB.

For more information about the inventor(s) and their research, please see

[Dr. Constantine Balanis' Directory Page](#)

