Reseachers at the University of South Florida have developed a novel periodic spiral antenna that utilizes a combination of the z-direction and a tapered substrate profile to provide for volumetric miniaturization of Ultra-Wideband (UWB) spiral antennas.

Wide-bandwidth antennas are used to serve several functions including navigation, broadcasting, and personal communication. Spirals are widely used circularly polarized wideband antennas and as a result of the spiral’s wideband features, much attention has been focused in miniaturization. Efficient miniaturization of UWB antennas is of interest for applications that place a restriction on aperture size and volume. Various techniques can be employed to reduce wave velocity and thus shrink the antenna footprint, including meandering of the antenna to increase inductance per unit length and utilizing high permittivity substrates. Other techniques have been investigated that load the arms of a spiral with lumped elements to reduce the wave velocity. Unfortunately, the miniaturization that these techniques provide comes at the cost of antenna performance, such as decreased efficiency. In view of this, it would be desirable to have an alternative way to miniaturize an antenna.

USF Inventors have developed novel miniaturized, 3D, periodic spiral antennas that have a height (z) dimension that is used to inductively load the antenna while maintaining uniform capacitance. The periodic spiral antenna includes first and second arms that form interleaved spirals parallel to an x-y plane, with the arms having a height dimension that extends along a z direction that is perpendicular to the x-y plane. The interleaved spirals form multiple turns of the antenna and the turns are equally spaced from each other throughout the antenna.