Title: A Class of Broadband Planar Traveling-Wave Antennas and Their Latest Applications

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Classical antenna theory often ignores the practical problem of platform mounting, which can have deadly impact on antenna performance. This is an unavoidable problem since an antenna is invariably inseparable from a transceiver or platform, which the antenna is connected with or mounted on. In the worst scenario, the main radiator is the platform or transceiver, not the antenna per se. The slot antenna and the microstrip patch antenna provide a narrowband solution to this problem. For broadband needs, a class of planar traveling-wave (TW) antennas, as depicted in Figure 1, and TW phased arrays employing such TW elements, emerged in the past two decades [e.g., 1], offering a satisfactory solution. This paper addresses the fundamental theory for this class of planar TW antennas.

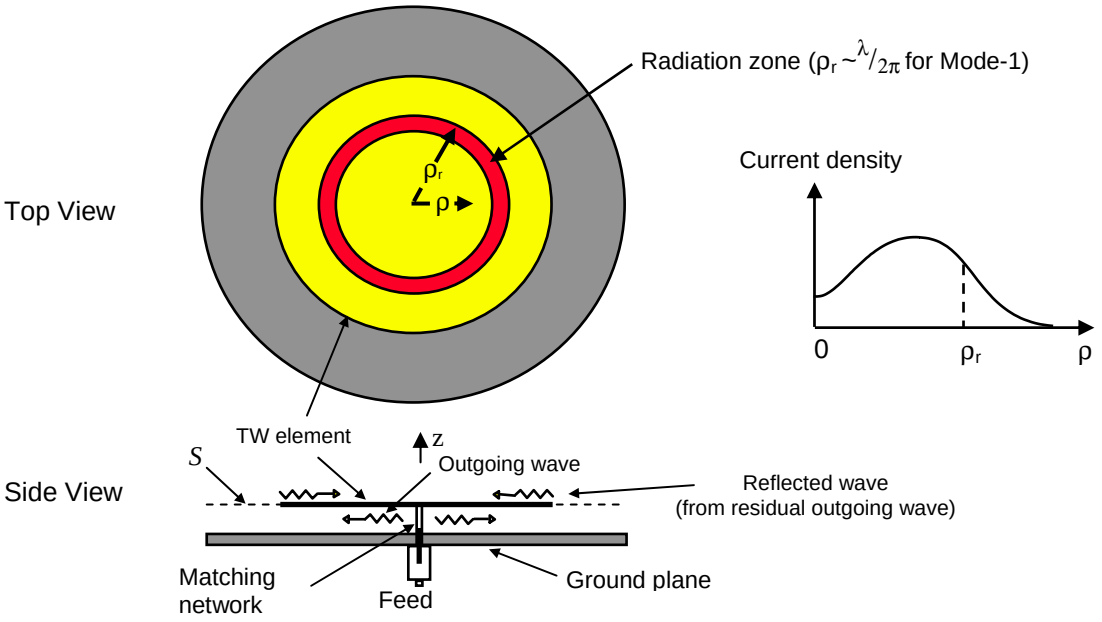

Figure 1. The planar TW antenna.

A common feature of these patented designs is a ground plane placed very close to a planar broadband TW structure, which is preferably a self-complementary surface. The TW is characterized by a radial component of propagation to and from the geometrical center of the planar TW structure. The conducting ground plane on the back side of the antenna enables the antenna to be conformally mounted on any platform, with minimal EMC/EMI problems as well as a stable radiation property fairly independent of the mounting platform. In addition to an octaval bandwidth of 10:1 or more, this class of broadband planar TW antenna offers features such as dual-polarization and multifunction rarely available in other antennas.

Applications include ultra-wideband conformal body-wearable antennas, air/sea/ground vehicle antennas, handset antennas, planar phased arrays, etc. A recent application is in high-performance low-cost GNSS antennas that cover all three GNSS services (GPS/GLONASS/Galileo), requiring a wide frequency bandwidth of 1.164-1.610 GHz. The TW structure in this design is a planar four-arm spiral, which has an inherently stable phase center nearly independent of spatial and frequency variations. Such a performance is not achievable by conventional GNSS antenna approaches such as the patch antenna and other broadband antennas. Its phase center stability versus frequency and spatial angle is primarily limited by its manufacturing tolerance and the excitation accuracy of its feed network.

References

1. J. J. H. Wang, D. J. Triplett, and C. J. Stevens, "Broadband/Multiband Conformal Circular Beam-Steering Array," *IEEE Trans. Antennas and Prop*. Vol. 54, No. 11, November 2006.