IEEE AP/MTT/EMC Society Syracuse Chapter

Phased Arrays with Cubic Phase Distribution and Non-Diffracting Beams

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Wednesday, October 24, 2018
5:30-6pm: Social and Refreshments
6:00-7pm: Technical Talk
7:00-7:30: Questions and Discussion

Location
Rachel's Restaurant - Private Dining Room
Sheraton Syracuse University Hotel
801 University Avenue, Syracuse, NY 13210

Abstract:

In this research, we show generation of an asymmetric far field radiation pattern for uniform linear and planar phased arrays using excitation phases that belong to a family of odd functions. The phase distribution on the aperture reflects phase reversal symmetry along the diagonal of the square radiating aperture. The mainlobe and most of the dominant sidelobes are contained in one quadrant of the azimuthal plane, while the sidelobes in the remaining quadrants are reduced significantly by 9 dB, at least. In comparison, such an asymmetric radiation pattern is unlike a conventional phased array which produces a symmetric pattern. The asymmetrical sidelobe distribution is achieved while maintaining the main lobe intensity and beamwidth. It is shown that applying the Chebyshev amplitude modulation further enhances the sidelobe asymmetry, while also increasing the array directivity. The designed phased arrays have good scan performance from -45^0 to 45^0 in the elevation and azimuth planes with an ability to maintain constant directivity gain.

Second, the odd phase distribution results in non-diffracting beams for GHz and mm-wave applications. The non-diffracting beam allows for significantly improved power reception, compared to a conventional antenna or array, and preserves information in the main lobe. A flat phase plate with cubic odd phase distribution is designed to generate a non-diffracting Airy beam for a propagation distance of a few hundreds of meters to a few kilometers in the frequency range 1-100 GHz. Propagation of the non-diffracting beam is simulated using a Fourier beam propagation method. Numerical simulation results for plane wave and Gaussian beam excitations are presented.

Biography:
Dr. Patanjali V. Parimi is Director for the Advanced Wireless Systems Research (ADWISR) Center at SUNY Oswego. Prior to joining SUNY, he worked at Newlans, SI2 Technologies, Cobham Defense Electronic Systems and Northeastern University. He has developed several next gen GPS, Satcom, EW, and ISR communication and radar systems. He has published more than 70 peer reviewed research papers, filed 5 patents, and has given numerous invited talks. He won as a Principal Investigator more than 20 DARPA, NSF, SBIR, STTR and BAA R&D Awards of $11M. Dr. Parimi is widely recognized for his research and development in wideband analog signal processing, antennas/arrays and metamaterials. For additional information about SUNY Oswego ADWISR or to contact Dr. Parimi, please visit http://cs.oswego.edu/adwisr