

1) **Title of the tutorial :**
Ultra Wide Band Surveillance Radar

2) **Instructors name and affiliation:**
Dr. Mark E. Davis, Consultant USA

3) **300 word abstract describing the proposed topic and including an outline of the contents:**

Description: Ultra Wide Band Surveillance Radar is an emerging technology for detecting and characterizing targets and cultural features for military and geosciences applications. It is essential to have fine range and cross-range resolution to characterize objects near and under severe clutter. This Tutorial is divided into five parts.

- **The Early History of Battlefield Surveillance Radar:** Battlefield surveillance from manned and unmanned aircraft, along with early experiments in fixed and moving target detection and foliage penetration are covered. There were some very interesting developments in radar technology that enabled our ability to detect fixed and moving objects in dense clutter. Examples of airborne phased array antennas and UWB radars will be summarized.
- **UWB Phased Array Antenna:** Electronically scanned antennas are widely used for surveillance of large areas. Wideband waveforms place a significant demand on the ESA design to maintain gain and sidelobe characteristics. Design of ESA systems with time delay steering and digital beamforming will be described.
- **UWB Synthetic Aperture Radar (SAR):** A brief description of several UWB surveillance SAR systems will be provided, along with illustrations of the SAR image and fixed object detection capability. Techniques developed for ultra-wideband and ultra-wide-angle image formation will be presented.
- **UWB Ground Moving Target Indication:** Space time adaptive processing (STAP) has been used for over 20 years for detecting and tracking moving targets in clutter. As the resolution is improved for target characterization, the limits of STAP are tested. This section will discuss two approaches for increasing the bandwidth and maintaining geolocation accuracy: wideband STAP and Along Track Interferometry.
- **New research in Multi-mode Ultra-Wideband Radar,** with the design of both SAR and moving target indication (MTI) FOPEN systems. The last section of the tutorial will illustrate new technologies that have promise for future multimode operation: simultaneous SAR and GMTI in a multichannel radar.

4) **Target audience & 5) Assumed knowledge:**

This tutorial is meant for graduate students or program managers who wish to expand their knowledge of new technologies for surveillance radar based on emerging RF and digital technologies.