

Ultra Wide Band Surveillance Radar



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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 contains 5 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. Developments in radar technology from MASR, HOWLS, GeoSAR, P3 UWB SAR, and Multibeam MSR enabled our ability to detect fixed and moving objects in dense clutter.
- **UWB Phased Array Antenna:** Wideband waveforms place a significant demand on the ESA design to maintain gain and sidelobe characteristics. Design of ESA systems with active arrays, time delay steering and digital multiple beamforming will be described.
- **UWB Synthetic Aperture Radar (SAR):** A brief description of UWB SAR systems will be provided. Techniques developed for ultra-wideband and interferometric image formation will be presented. The impact of regulations on RF spectrum will be illustrated.
- **UWB Ground Moving Target Indication:** Space time adaptive processing (STAP) has been used for detecting and tracking moving targets in clutter. 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:** Modern surveillance systems require both SAR and moving target indication (MTI) modes. This section illustrates new technologies for future multimode operation: simultaneous SAR and GMTI in a multichannel radar.

Lecturer Biography: Dr Mark E Davis has over 50 years' experience in Radar technology and systems development. He has held senior management positions in the Defense Advanced Research Projects Agency (DARPA), Air Force Research Laboratory,

and General Electric Aerospace. At DARPA, he was the program manager on both the foliage penetration (FOPEN) radar advanced development program and the GeoSAR foliage penetration mapping radar. Dr Davis wrote the text being used in this tutorial: "Ultra Wideband Surveillance Radar", published by IET London UK in February 2021.

His education includes a PhD in Physics from The Ohio State University, and Bachelor and Master's Degrees in Electrical Engineering from Syracuse University. He is a Life Fellow of both the IEEE and Military Sensing Symposia, and Past-President of IEEE Aerospace Electronics Systems Society, past-VP Conferences, and past-Chair the Radar Systems Panel. He is the 2011 recipient of the AESS Warren D White Award for Excellence in Radar Engineering, and the 2018 IEEE Dennis J. Pickard Medal for Radar Technologies and Applications.