

Modern Trends in Microwave and THz Imaging for Security and NDT

Matthew Dvorsky¹, Reza Zoughi²

¹Center for Nondestructive Evaluation, Iowa State University, USA, ²Electrical and Computer Engineering Department, Iowa State University, USA

The use of microwave (and millimeter-wave) and terahertz imaging techniques for nondestructive evaluation (NDE) and security purposes began its rapid growth in the early 2000s. For microwave and terahertz NDE in particular, the recent prevalence of composite materials and structures in a variety of applications has been a significant factor in its rapid growth. Microwave imaging methods utilize frequencies ranging from 300 MHz to 300 GHz, which readily penetrate many of the dielectric materials that make up the composite structures used in a variety of modern applications. Terahertz imaging methods utilize much higher frequencies (300 GHz onward) and thus suffer from limited penetration into materials and structures but at the same time benefit from very high spatial resolution. Additionally, the ability of microwave and terahertz methods to produce images in a non-contact, one-sided, and rapid manner enables these methods to address existing gaps in capabilities that are important to NDE and security applications. All of these have been complemented by the recent increased availability and advancements in design of the high frequency components that are required for these techniques to be successful. This presentation is focused on recent advances in microwave and terahertz imaging methods, specifically related to how these methods are utilized in security and NDE applications.