## Advances in Microwave and Millimeter Wave Imaging for Nondestructive Testing Applications

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## Abstract

Microwave and millimeter-wave signals span the frequency range of ~300 MHz to 30 GHz and 30 GHz to 300 GHz, corresponding to the wavelengths of 1,000 mm to 10 mm and 10 mm to 1 mm, respectively. Besides the ability to penetrate dielectric composite structures, the relatively small wavelengths and wide bandwidths associated with these signals enable the production of high spatial-resolution images of structures. Incorporating imaging techniques such as lens-focused and near-field techniques, synthetic aperture focusing, holographical methods, robust back-propagation algorithms with more advanced and unique millimeter wave imaging systems have brought upon a flurry of activities in this area and in particular for nondestructive evaluation (NDE) applications. Recent activities have focused on developing one-shot, real-time, high-resolution image of a structure, recently the design and demonstration of a 6" by 6" one-shot, rapid and portable imaging system (Microwave Camera), consisting of 576 resonant slot elements, was completed. Currently, efforts are being expended to enable mono-static imaging and increasing its operating frequency into higher millimeter wave frequencies. This presentation provides an overview of these techniques, along with illustration of several critical examples.

**Target Audience** – Anyone interested in microwave and millimeter wave nondestructive testing (NDT) techniques as well as microwave and millimeter wave imaging methods and applications.

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