Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

Case ID:M06-147P
Published: 10/25/2022

Inventors

Rodolfo Rudy Diaz
Jeff Peebles
Zhichao Zhang
Richard LeBaron
Lorena Lozano-Plata

Contact

Shen Yan
shen.yan@skysonginnovations.com

Compact Broad-Band Admittance Tunnel Incorporating Gaussian Beam Antennas

Microwaves have a wide use in telecommunications, radar, semiconductor, industrial, and biological applications. Hence, a precise knowledge of the microwave properties of materials is critical for efficient design and operation of microwave systems. In the measurement of dielectric and magneto-dielectric constitutive properties of lossy materials, an admittance tunnel is usually setup. This apparatus is used to characterize the materials for absorption of electromagnetic energy. In a typical application, large areas of the material interact with the incident wave. Hence, it is desirable that the properties of the test material measured represent the overall average properties. However, manufacturing inhomogeneities in the material may result in significant errors. Hence, there exists a need for a method to measure the material properties in a small region under plane wave incidence condition.

Researchers at Arizona State University have developed a technique and an apparatus (a broadband antenna) for measuring the dielectric and magneto-dielectric properties of electromagnetic materials. A layered dielectric polyrod is coupled to a broadband double-ridged waveguide horn to provide a plane wave incidence condition onto a material sample in a compact domain. The antenna provides the plane wave interaction between an electromagnetic wave and a sample at an operation frequency ranging from 0.7GHz to 20GHz. The technique can be used to measure material samples of areas from 1 foot X 1 foot up to 3 feet X 3 feet and thickness ranging from 0.002 inches to 6 inches. Also, the antenna is compatible with the industry standard data-reduction algorithms and provides an accurate approximation of plane wave incidence.

Issued Patent: U.S. Pat. No. 7,889,148

Potential Applications

- Testing performance of materials
- Measuring constitutive parameters of dielectric and magneto-dielectric materials

Benefits and Advantages

- Accurate modeling of plane wave conditions in a small region
- Generate smooth and consistent results
- Offer a simple to implement and an economical design
- Works in a wide range of frequency 0.7GHz to 20.0GHz
- Enhanced signal to noise ratio
- Versatile to use with different antenna types and diffraction control techniques