

## Challenges of Modern Material Measurements

### **Abstract**

In the past, electromagnetic material characterization measurements focused primarily on extracting the permittivity and permeability of simple media at microwave frequencies. However, recent advancements in technology have made it possible to fabricate and consequently measure more exotic (i.e., non-simple) media well into the optical regime. These modern materials present many challenges to the measurement community since they may exhibit nonlinear, non-isotropic, spatially nonlocal, time-varying and/or nonreciprocal behavior. The primary goals of this workshop are to discuss challenges encountered in extracting electromagnetic constitutive parameters of exotic materials and to subsequently identify potential solutions via invited talks and group participation.

### **Workshop**

- **SLOT #1**

The first time slot is dedicated to invited talks on the various types of modern materials and their constitutive relations, including nonlinear, non-isotropic, spatially/temporally nonlocal, spatially/temporally nonhomogeneous media. These talks will discuss techniques and challenges of measuring the electromagnetic properties of these modern materials.

- **SLOT #2**

The second time slot is primarily dedicated to small and large group discussions. Each small group (led by researchers active in a given field) will focus on a specific category of modern materials. These small groups will help identify challenges and potential solutions for measuring each type of material. The small groups will subsequently come together as a large group to discuss their findings. Future directions for the material measurement community will be discussed as well as the possibility of forming a global material measurement working group.

- **Dr. Michael J. Havrilla** is a Professor of Electrical Engineering at the Air Force Institute of Technology, Wright-Patterson AFB, OH. Dr. Havrilla's teaching and research interests are in the measurement and applications of anisotropic and bianisotropic media.
- **Dr. Peter J. Collins** is a Professor of Electrical Engineering with the Air Force Institute of Technology, Wright-Patterson AFB, OH. Dr. Collins' research interests are in the areas of electromagnetic materials design and computational electromagnetics.

### **Conference Topic/Track**

M01 Material characterisation and non-destructive testing

T11 Fundamental research and emerging technologies