

Some new perspectives in metamaterials

Vincenzo Galdi

Waves Group, Department of Engineering, University of Sannio, I-82100 Benevento, Italy

In this talk, we present an overview of results from our recent and ongoing research in the field of metamaterials.

In particular, we illustrate the parity-time symmetry concept and the wealth of anomalous propagation effects that may arise from the complex interplay of balanced loss and gain.

Then, we focus on the concept of “metamaterial analog computing,” based on suitably designed metamaterial blocks that can perform mathematical operations (such as spatial differentiation, integration, or convolution) on the profile of an impinging wave as it propagates through them.

Finally, inspired by the transformation-optics theory, we introduce a “transformation multiphysics” approach which allows the simultaneous manipulation of multiple physical phenomena (e.g., thermal and electrical) in independent fashions.