# Electromagnetic Metamaterials: Transmission Line Theory and Microwave Applications

*Christophe Caloz, Tatsuo Itoh*

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**Electromagnetic Metamaterials: Transmission Line Theory and Microwave Applications** Christophe Caloz, Tatsuo Itoh
Electromagnetic metamaterials-from fundamental physics to advanced engineering applications

This book presents an original generalized transmission line approach associated with non-resonant structures that exhibit larger bandwidths, lower loss, and higher design flexibility. It is based on the novel concept of composite right/left-handed (CRLH) transmission line metamaterials (MMs), which has led to the development of novel guided-wave, radiated-wave, and refracted-wave devices and structures.

The authors introduced this powerful new concept and are therefore able to offer readers deep insight into the fundamental physics needed to fully grasp the technology. Moreover, they provide a host of practical engineering applications.

The book begins with an introductory chapter that places resonant type and transmission line metamaterials in historical perspective. The next six chapters give readers a solid foundation in the fundamentals and practical applications:
* Fundamentals of LH MMs describes the fundamental physics and exotic properties of left-handed metamaterials
* TL Theory of MMs establishes the foundations of CRLH structures in three progressive steps: ideal transmission line, LC network, and real distributed structure
* Two-Dimensional MMs develops both a transmission matrix method and a transmission line method to address the problem of finite-size 2D metamaterials excited by arbitrary sources
* Guided-Wave Applications and Radiated-Wave Applications present a number of groundbreaking applications developed by the authors
* The Future of MMs sets forth an expert view on future challenges and prospects

This engineering approach to metamaterials paves the way for a new generation of microwave and photonic devices and structures. It is recommended for electrical engineers, as well as physicists and optical engineers, with an interest in practical negative refractive index structures and materials.

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