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SPECIAL SECTION PAPERS

MAGNET-FREE NONRECIPROCITY

Edited by A. Alù

1684 Tutorial on Electromagnetic Nonreciprocity and Its Origins
By V. S. Asadchy, M. S. Mirmoosa, A. Díaz-Rubio, S. Fan, and S. A. Tretyakov
|INVITED PAPER| This article reviews the long history of research on electromagnetic nonreciprocity, its origins, and its implications. It aims to put into context the recent advances and progress in this area of research, and straighten up erroneous claims on what nonreciprocity actually implies.

1728 Microwave Nonreciprocity
By A. Kord, D. L. Sounas, and A. Alù
|INVITED PAPER| This article reviews the various available approaches to nonreciprocity available for microwave technologies, from magnetic bias to temporal modulations and nonlinearities, discussing the advantages and drawbacks of each approach in terms of various metrics of performance, and providing a promising outlook for magnet-free nonreciprocal technology at microwave frequencies.

1759 Integrated Nonreciprocal Photonic Devices With Dynamic Modulation
By I. A. D. Williamson, M. Minkov, A. Dutt, J. Wang, A. Y. Song, and S. Fan
|INVITED PAPER| This article reviews the use of time modulation to break reciprocity in photonic devices, their various implementations, and potential opportunities for photonic technology.

REGULAR PAPERS

1785 Digital Twin in the IoT Context: A Survey on Technical Features, Scenarios, and Architectural Models
By R. Minerva, G. M. Lee, and N. Crespi
|CONTRIBUTED PAPER| This survey covers state-of-the-art approaches and discusses major technologies that have contributed to the field of Digital Twin.

1825 Software Vulnerability Detection Using Deep Neural Networks: A Survey
By G. Lin, S. Wen, Q.-L. Han, J. Zhang, and Y. Xiang
|CONTRIBUTED PAPER| The survey provides a state-of-the-art treatment of deep-learning-/neural-network-based approaches for detecting software vulnerabilities and identifies challenges in this field.

DEPARTMENTS

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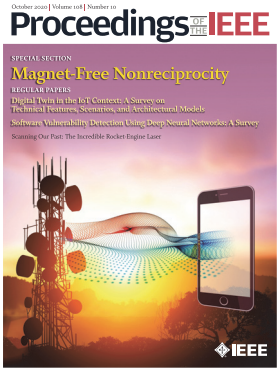
Magnet-Free Nonreciprocity
By A. Alù

1849 SCANNING OUR PAST
The Incredible Rocket-Engine Laser
By J. Hecht

1858 FUTURE SPECIAL ISSUE/SPECIAL SECTIONS



On the Cover:
Our cover image this month aptly captures the theme of our special section on magnet-free nonreciprocity.