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# Guest editorial: Electromagnetic modelling exploiting fields and circuits

Guest editorial

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It is a great pleasure to introduce this special issue of COMPEL (*The International Journal for Computation and Mathematics in Electrical and Electronic Engineering*) with selected and extended papers presented originally at the 26th Symposium on Electromagnetic Phenomena in Nonlinear Circuits (EPNC 2020) held from 7 to 9 April 2021. Due to the pandemic, the symposium originally scheduled to be held at the end of June 2020 in Torino, Italy, was firstly delayed and then took place entirely online. The 26th EPNC Symposium was organized by Politecnico di Torino, Dipartimento Energia “Galileo Ferraris” and by the Poznan University of Technology, Faculty of Electrical Engineering, Poland. Professor Maurizio Repetto was the Chairmen of the Organizing Committee.

The first EPNC Symposium took place in Poznań, Poland, in November 1972. The first 11 conferences were local meetings, although speakers from other countries also participated. The last 15 conferences were international events with proceedings published in English. Initially, selected papers from the EPNC conferences were submitted to regular issues of COMPEL. After EPNC 2004, for the first time, selected and extended papers from the EPNC were published as a special issue of COMPEL. The current issue of COMPEL is the ninth consecutive special issue. The aim of the EPNC conferences was to present the recent advances in the analysis and synthesis of nonlinear electric and magnetic circuits as well as in nonlinear optics and nonlinear electromagnetic problems in medical science, additionally, to provide a forum for discussion and dissemination of recent results on applications of nonlinear phenomena in electrical engineering. The EPNC conferences are intended to be an opportunity to exchange ideas and experiences between specialists and young PhD students in electromagnetic field modelling, electric drives, electronics, electrical machines and electric and magnetic materials. The topics of the symposiums included: ferromagnetics and magnetic circuits, semiconductors and nonlinear electric circuits, nonlinear optics and wave propagation, as well as nonlinear electromagnetic problems in the field of medical science.

During the EPNC 2020, 35 papers were presented by participants from 10 countries. Two-page versions of all papers were published in the conference proceedings prepared in an electronic version. A limited number of extended papers, selected in a peer review process, were chosen by EPNC 2020 Editorial Board and COMPEL Guest Editors for publication in this special issue of COMPEL. The papers and the discussion at the Symposium confirmed the recent trends in electromagnetism and electrical engineering.

The symposium started with the keynote presented by Professor Nicola Femia from the University of Salerno, Italy, whose interesting speech “Power Electronics to Energetic Intelligence: an Evolutionary Challenge for Designers and Educators” remarked on the need for the integration of multidisciplinary analysis in modern electrical engineering. This trend was then confirmed by other talks that regarded the design of energy conversion processes for harvesting renewable energy, the optimization of special components with particular attention to the evaluation of losses and integration with power electronic converters. The discussed models consider multiphysical phenomena in electrical systems and include new,



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accurate descriptions of magnetic and conducting materials with particular attention to losses and efficiency of the electromechanical conversion process. Many authors of the papers were motivated by the increasing efficiency requirements for electrical drives because of the European and international regulations regarding these devices.

We hope that this issue of COMPEL will provide new, stimulating information to the readers.

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