Special Issue: The 10th International Symposium on Electric and Magnetic Fields (EMF 2016)

On behalf of the Editorial Board, we are pleased to present a selection of papers related to the 10th International Symposium on Electric and Magnetic Fields (EMF 2016) held in Lyon, France, on April 12-14, 2016.

The EMF Symposium series, whose first edition was held in Liège, Belgium, in 1992, aims at building a bridge between recent research advances in mathematical and numerical modelling of electromagnetic fields and the growing number of industrial problems requiring such techniques. The 10th edition was organized by the Ampère Laboratory (CNRS and Ecole Centrale de Lyon), and attracted 122 participants from 15 countries.

Among the 120 presentations in the Symposium program, Twenty-four papers were selected for publication in this special issue of the International Journal of Numerical Modelling: Electronic Networks, Devices and Fields. The high scientific and technical quality of the Symposium is well reflected in the quality of the manuscripts contained in this special issue.

Four broad topics were covered during this 10th edition of the symposium. The first major topic considers the mathematical modelling of electromagnetic problems in view of their eventual numerical solution on computers, with contributions on the modelling of electromagnetic forces [1], high-temperature superconductors [2], eddy current problems [3, 4] and high-frequency Maxwell/transport phenomena [5]. The second major topic treats the numerical modelling of the electromagnetic behavior of electric and magnetic materials, with contributions on the modelling of magnetoelectric multilayer laminate composites [6], the magneto-elastic behavior of steel sheets [7], the effect of mechanical stresses on Graphene-based devices [8] and the effect of temperature on static magnetic hysteresis [9]. The third major topic concerns fast solvers for electromagnetic applications with contributions on ultra weak variational formulations [10] and the behavior of natural and finite element interpolation functions [11], domain decomposition methods for finite volume, finite element and boundary element schemes [12, 13, 14], explicit time integration of eddy current problems [15] and the GPU acceleration of Maxwell solvers for differents applications [16, 17]. The fourth major topic concerns the application of electromagnetic modelling, uncertainty quantification and model order reduction techniques to novel or challenging applications, with contributions to electrothermal field problems [18], electric machine modelling [19, 20, 21], lightning-produced electromagnetic fields [22], electronic circuits [23] and electrical capacitance tomography sensors [24].

We wish to dedicate this special issue to our friend and colleague Patrick Dular, who passed away prematurely on September 6th 2017. Patrick co-organized six editions of the EMF symposium between 1996 and 2009, and was an active

member of the EMF scientific committee. We will miss him dearly.

We express our gratitude to the other members of the EMF scientific committee—P. Alotto, J.P.A. Bastos, O. Biro, M. Clemens, W.A. Cronje, A. Demenko, L. Dupré, J. Gyselinck , K. Hameyer, L. Kettunen, A. Kost, V. Mazauric, J. Melkebeek, G. Meunier, A. Nicolet, F. Piriou, A. Razek, M. Repetto, G. Rubinacci, R. Sabariego, J.K. Sykulski, M. Trlep and T. Weiland—as well as to all the reviewers, who provided the necessary volunteer time and expertise to conduct a fair and detailed review, ensuring high publication standards for the selected manuscripts.

We also want to thank the staff from the *Association des ingénieurs de Montefiore* (AIM) for their help organizing the EMF symposium series: the next edition will be held in Darmstadt, Germany in April 2018.

We hope you will enjoy reading this selection of articles.

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[2] L. Makong, A. Kameni, F. Bouillault, C. Geuzaine, P. Masson. Nodal discontinuous Galerkin method for high-temperature superconductors modeling based on the H-formulation.

[3] D. Prémel, G. Granet. Development of the curvilinear coordinate method for the computation of quasi-static fields induced by an eddy current probe scanning a 3D conductor of complex shape characterized by an arbitrary 2D surface

[4] R. Plasser, Y. Takahashi, G. Koczka, O. Bíó. Comparison of 2 methods for the finite element steady-state analysis of nonlinear 3D periodic eddy-current problems using the A, V-formulation

[5] C. Dalle. 2D timedomain numerical Maxwell/transport modeling for THz distributed gallium nitride transferred electron device.

[6] G. Yang, H. Talleb, Z. Ren. Investigation of magnetoelectric multilayer laminate composites with series and parallel electrical connections.

[7] D. Vanoost, S. Steentjes, J. Peuteman, H. De Gersem, D. Pissoort, K. Hameyer. Multiscale and macroscopic modeling of magneto-elastic behavior of soft magnetic steel sheets.

[8] Y. Zheng, G. Valerio, Z. Ren. Effect of Mechanical Stresses on Graphene-Based Devices.

[9] F. Sixdenier, R. Scorretti. Numerical model of static hysteresis taking into account temperature.

[10] A. Gimpel, E. J. Silva, M. M. Afonso. Performance analysis of the ultra weak variational formulation to compute electromagnetic fields on nonuniform meshes.

[11] B. M. F. Gon calves, M. M. Afonso, E. H. R. Coppoli, B. Ramdane, Y. Marechal, C. Vollaire, L. Krähenbühl. Comparison of natural and finite element interpolation functions behavior.

[12] M. Bonazzoli, V. Dolean, F. Rapetti, P.-H. Tournier. Parallel preconditioners for high-order discretizations arising from full system modeling for brain microwave imaging.

[13] N. V. Kantartzis, T. T. Zygiridis, T. D. Tsiboukis. Efficient Krylov-based 3D FVTD schemes with adaptive domain decomposition for graphene and nanostructured EMC components.

[14] S. Grabmaier, M. Jüttner1, D. Vögeli, W. M. Rucker, P. Göhner. Numerical framework for the simulation of dielectric heating using finite and boundary element method.

[15] J. Dutiné, M. Clemens, S. Schöps, G. Wimmer. Explicit time integration of transient eddy current problems.

[16] A. Rudenko, J.-P. Colombier, T. E. Itina. Graphics processing unit-based solution of nonlinear Maxwells equations for inhomogeneous dispersive media.

[17] C. Cimala, M. Clemens, J. Streckert, B. Schmuelling. Highresolution magneticfield exposure simulations of automotive inductive powertransfer systems using a scaledfrequency finite difference time domain approach with multiGPU acceleration.

[18] D. Loukrezis, U. Römer, T. Casper, S. Schöps, H. De Gersem. High-dimensional uncertainty quantification for an electrothermal field problem using stochastic collocation on sparse grids and tensor train decompositions.

[19] M. Al Eit, F. Bouillault, C. Marchand, G. Krebs. Modelorder nonlinear subspace reduction of electric machines by means of POD and DEI methods for copper losses calculation.

[20] L. Montier, T. Henneron, S. Clénet, B. Goursaud. Robust model order reduction of an electrical machine at startup through reduction error estimation.

[21] J. Fontchastagner, T. Lubin, D. Netter. Axial-field eddy-current coupling: a 3D test problem for numerical experiments.

[22] T. Zygiridis, N. Kantartzis, T. Tsiboukis. Investigation of uncertainty in lightning-produced EM fields with a polynomial-chaos FDTD approach.

[23] M. Ferber, A. Korniienko, J. Löfberg, F. Morel, G. Scorletti, C. Vollaire. Efficient worst-case analysis of electronic networks in intervals of frequency.

[24] Y. Oussar, J. Lucas, S. Holé. One or two circular shapes? A binary detection for electrical capacitance tomography sensors.