

High-Frequency Techniques in Diffraction Theory: 50 Years of Achievements in GTD, PTD, and Related Approaches (Second Part)

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This is the second part of a special section of the *IEEE Antennas and Propagation Magazine* that – as stated in the title – was conceived to celebrate 50 years since the publications of two fundamental scientific works: the paper by

J. B. Keller, “Geometrical Theory of Diffraction,”
Journal of the Optical Society of America, **52**, 1962,
pp. 116-130;

and the book by

P. Ya. Ufimtsev, *Method of Edge Waves in the
Physical Theory of Diffraction*, Moscow, Soviet
Radio, 1962 (in Russian).

The first part of this special section was published in the June issue, and contained the following papers:

P. Ya. Ufimtsev, “The 50-Year Anniversary of the
PTD: Comments on the PTD’s Origin and Development;”

Y. Rahmat-Samii, “GTD, UTD, UAT, and STD: A
Historical Revisit and Personal Observations;”

G. Pelosi and S. Selleri, “The Wedge-Type Problem:
The Building Brick in High-Frequency Scattering
from Complex Objects.”

The papers constituting this second half of the special section are the following:

J. L. Volakis, “Diffraction by Canonical Metallic
and Material-Coated Structures: A Review;”

P. L. Christiansen, N. Chr. Albersen, and O.
Breinbjerg, “50 Years with J. B. Keller’s Geometrical
Theory of Diffraction in Denmark – Revisiting
the Theory: Impedance Half-Plane Diffraction
Coefficients;”

P. H. Pathak, G. Carluccio, and M. Albani, “The
Uniform Geometrical Theory of Diffraction and
Some of its Applications.”

A valuable postface by J. Keller follows these papers. A personal annotated bibliography by the editors closes the special section.

While this special section could not be comprehensive of the whole work in high-frequency techniques carried out worldwide, we believe this special section has nevertheless been useful in pointing out the most relevant contributions to the fascinating topic of high-frequency electromagnetic diffraction.

Introducing the Guest Editors



Giuseppe Pelosi was born in Pisa, Italy, in 1952. He received the Laurea (Doctor) degree in Physics (summa cum laude) from the University of Florence in 1976. He is currently with the Department of Information Engineering of the same university, where he is currently Full Professor of Electromagnetic Fields. He was a Visiting Scientist at McGill University, Montreal, Quebec, Canada, from 1993 to 1995, and a Professor at the University of Nice-Sophie Antipolis, France, in 2001.

His research activity is mainly focused on numerical techniques for applied electromagnetics (antennas, circuits, microwave and millimeter-wave devices, scattering problems). He was coauthor of several scientific publications on the aforementioned topics, appeared in international refereed journals, and national and international conferences. He has been guest editor of several special issues of international journals: *IEEE Transactions on Antennas and Propagation*, 2001 (with V. Grikunov and I. L. Volakis); *International Journal of Numerical Modelling: Electronic Networks, Devices and Fields*, 2000 (with P. Guillon and T. Itoh); *Electromagnetics*, 1998 (with J. L. Volakis); *Annales des Telecommunications* (with J. L. Bernard and P. Y. Ufimtsev), 1995; *COMPEL*, 1994 (with P. P. Silvester); *COMPEL*, 2002; *Alta Frequenza-Rivista di Elettronica*, 1992.

He is also coauthor of three books: *Finite Elements for Wave Electromagnetics* (with P. P. Silvester, IEEE Press, 1994), *Finite Element Software for Microwave Engineering* (with T. Itoh and P. P. Silvester, Wiley, 1996), and *Quick Finite Elements for Electromagnetic Fields* (with R. Coccioli and S. Selleri, Artech House, 1998 and 2009). With P. P. Silvester (McGill University), he was promoter of the International Workshop on Finite Elements for Microwave Engineering. This workshop is held every two years, and is the meeting point for finite-element researchers from all over the world. The next workshop, number 14, will be held in 2014 in Chengdu, China.

Prof. Pelosi is also active in the history of the telecommunications engineering field. He has been Associate editor for the Historical Corner of the *IEEE Antennas and Propagation Magazine* since 2006. Among his latest publications in this field is the book, *A Wireless World. One Hundred Years Since the Nobel Prize to Guglielmo Marconi* (series contribution to the History of the Royal Swedish Academy of Sciences, 2012).

Prof. Pelosi was elected a Fellow of the IEEE “for contributions to computational electromagnetics.” He has been a member of the Board of Directors of the Applied Computational Electromagnetics Society (ACES) (1999-2001), of the Board of Directors of the IEEE Central and South Italy Section (1992-1995 and 1995-1998), and Chair of the IEEE Magnetics Chapter of the same Section (1996-1999).



Yahya Rahmat-Samii is a Distinguished Professor, holder of the Northrop Grumman Chair in Electromagnetics, member of the US National Academy of Engineering (NAE), and past Chair of the Electrical Engineering Department, University of California, Los Angeles (UCLA). He was a Senior Research Scientist with the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL), California Institute of Technology, prior to joining UCLA in 1989. In the summer of 1986, he was a Guest Professor with the Technical University of Denmark (TUD). He has also been a consultant to numerous aerospace and wireless companies. He has been editor and guest editor of numerous technical journals and books. He has authored and coauthored over 800 technical journal and conference papers, and has written 30 book chapters. He is a coauthor of *Electromagnetic Band Gap Structures in Antenna Engineering* (Cambridge, 2009); *Implanted Antennas in Medical Wireless Communications* (Morgan & Claypool, 2006); *Electromagnetic Optimization by Genetic Algorithms* (Wiley, 1999); and *Impedance Boundary Conditions in Electromagnetics* (Taylor & Francis, 1995). He has received several patents. He has made pioneering research contributions in diverse areas of electromagnetics, antennas, measurement and diagnostics techniques, numerical and asymptotic methods, satellite and personal communications, human/antenna interactions, RFID and implanted antennas in medical applications, frequency-selective surfaces, electromagnetic band-gap structures, applications of genetic algorithms, and particle-swarm optimization (visit <http://www.antlab.ee.ucla.edu/>).

Dr. Rahmat-Samii is a Fellow of the Institute of Advances in Engineering (IAE), a Fellow of AMTA, a Fellow of the IEEE,

and a Fellow of ACES. He is a member of Commissions A, B, J, and K of USNC-URSI; the Antenna Measurement Techniques Association (AMTA); Sigma Xi; Eta Kappa Nu; and the Electromagnetics Academy. He was Vice President and President of the IEEE Antennas and Propagation Society in 1994 and 1995, respectively. He was appointed an IEEE AP-S Distinguished Lecturer and presented lectures internationally. He was a member of the Strategic Planning and Review Committee (SPARC) of the IEEE. He was the IEEE AP-S Los Angeles Chapter Chair (1987-1989); his Chapter won the best chapter awards in two consecutive years. He is listed in *Who's Who in America*, *Who's Who in Frontiers of Science and Technology*, and *Who's Who in Engineering*. He has been the plenary and millennium session speaker at numerous national and international symposia. He has been the organizer and presenter of many successful short courses worldwide. He was a Director and Vice President of AMTA for three years. He has been Chair and co-Chair of several national and international symposia. He was a member of the University of California at Los Angeles (UCLA) Graduate Council for three years. He was the Chair of USNC-URSI for 2009-2011.

For his contributions, Dr. Rahmat-Samii has received numerous NASA and JPL Certificates of Recognition. In 1984, he received the Henry Booker Award from USNC/URSI. Since 1987, he has been designated every three years as one of the Academy of Science's Research Council Representatives to the URSI General Assemblies held in various parts of the world. He was also an invited speaker addressing the URSI 75th anniversary in Belgium. In 1992 and 1995, he received the Best Application Paper Prize Award (Wheeler Award) for papers published in the 1991 and 1993 *IEEE Transactions on Antennas and Propagation*. In 1999, he received the University of Illinois ECE Distinguished Alumni Award. In 2000, Prof. Rahmat-Samii received the IEEE Third Millennium Medal and the AMTA Distinguished Achievement Award. In 2001, he received an Honorary Doctorate in Applied Physics from the University of Santiago de Compostela, Spain. In 2001, he became a Foreign Member of the Royal Flemish Academy of Belgium for Science and the Arts. In 2002, he received the Technical Excellence Award from JPL. He received the 2005 URSI Booker Gold Medal, presented at the URSI General Assembly. He is the recipient of the 2007 Chen-To Tai Distinguished Educator Award of the IEEE Antennas and Propagation Society. In 2008, he was elected to membership in the US National Academy of Engineering (NAE). In 2009, he was selected to receive the IEEE Antennas and Propagation Society's highest award, the Distinguished Achievement Award, for his outstanding career contributions. He was the recipient of the 2010 UCLA School of Engineering Lockheed Martin Excellence in Teaching Award, the 2011 UCLA Distinguished Teaching Award, and the 2011 IEEE Electromagnetics Award. Prof. Rahmat-Samii was the designer of the IEEE AP-S logo, which is displayed on all IEEE AP-S publications.



John L. Volakis was born in 1956 in Chios, Greece, and immigrated to the USA in 1973. He obtained his BE, summa cum laude, in 1978 from Youngstown State University, Youngstown, Ohio; the MSc in 1979 from The Ohio State University, Columbus, Ohio; and the PhD in 1982, also from The Ohio State University.

Prof. Volakis started his career at Rockwell International (1982-84), now Boeing. In 1984, he was appointed Assistant Professor at the University of Michigan, Ann Arbor, MI, becoming a full Professor in 1994. He also served as the Director of the Radiation Laboratory from 1998 to 2000. Since January 2003, he has been the Roy and Lois Chope Chair Professor of Engineering at The Ohio State University, Columbus, Ohio, and also serves as the Director of the ElectroScience Laboratory. Over the years, he has carried out research in antennas, wireless communications and propagation, computational methods, electromagnetic compatibility and interference, design optimization, RF materials, multi-physics engineering, bioelectromagnetics, terahertz, and medical sensing. His publications include eight books (among them, *Approximate Boundary Conditions in Electromagnetics*, 1995; *Finite Element Methods for Electromagnetics*, 1998; *Antenna Engineering Handbook, Fourth Edition*, 2007; *Small Antennas*, 2010; and *Integral Equation Methods for Electromagnetics*, 2011), over 320 journal papers, nearly 600 conference papers, and 23 book chapters. He has graduated/mentored over 70 doctoral students/post-docs, with 20 of them receiving best paper awards at conferences. His service to professional societies includes 2004 President of the IEEE Antennas and Propagation Society, twice the general Chair of the IEEE Antennas and Propagation Symposium, IEEE AP-S Distinguished Lecturer, IEEE AP-S Fellows Committee Chair, IEEE-wide Fellows Committee member, and Associate Editor of several journals. He is listed by ISI among the top 250 most-referenced authors (2004), and is a Fellow of IEEE and of ACES. Among his awards are the University of Michigan College of Engineering Research Excellence award (1993), the Scott award from The Ohio State University College of Engineering for Outstanding Academic Achievement (2011), the IEEE AP-S C-T. Tai Teaching Excellence Award (2011), and the IEEE Henning Distinguished Mentoring Award (2013).