



Announcing the 50 Most Referenced Papers of the IEEE Transactions on Electromagnetic Compatibility during the Past 50 Years (1964-2013)

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As you might know, the year 2014 marks the 50th anniversary of the IEEE Transactions on Electromagnetic Compatibility. As part of the 50th anniversary of the EMC Transactions, the 50 most referenced papers of the Transactions were identified using IEEE Xplore and are presented in Table 1.

The top referenced paper of the Transactions is the classical paper by G. Mur (Absorbing Boundary Conditions for the Finite-Difference Approximation of the Time-Domain Electromagnetic-Field, Vol. 23, No. 4, 1981). The paper deals with the finite-difference time-domain (FDTD) technique and the author presents highly absorbing boundary conditions that can

Table 1: The 50 most referenced papers of the IEEE Transactions on Electromagnetic Compatibility (1964-2013)

Rank	Document Title
1	Absorbing Boundary Conditions for the Finite-Difference Approximation of the Time-Domain Electromagnetic-Field Equations
2	Transient Response of Multiconductor Transmission Lines Excited by a Nonuniform Electromagnetic Field
3	Statistical-Physical Models of Electromagnetic Interference
4	Analysis and modeling of impulsive noise in broad-band powerline communications
5	A frequency-dependent finite-difference time-domain formulation for dispersive materials
6	Plane wave integral representation for fields in reverberation chambers
7	Generation of Standard EM Fields Using TEM Transmission Cells
8	Review and evaluation of lightning return stroke models including some aspects of their application
9	Statistical model for a mode-stirred chamber
10	An approximate formula for the calculation of the horizontal electric field from lightning at close, intermediate, and long range
11	Influence of a lossy ground on lightning-induced voltages on overhead lines
12	A Novel Method to Analyze Electromagnetic Scattering of Complex Objects
13	Aperture excitation of electrically large, lossy cavities
14	Analytical formulation for the shielding effectiveness of enclosures with apertures
15	Lightning-induced voltages on overhead lines
16	Shielding theory and practice
17	A comparison of the contributions of common-mode and differential-mode currents in radiated emissions
18	Investigation of fundamental EMI source mechanisms driving common-mode radiation from printed circuit boards with attached cables
19	Study of the ground bounce caused by power plane resonances
20	The adaptive cross approximation algorithm for accelerated method of moments computations of EMC problems
21	Finite-Difference Analysis of EMP Coupling to Thin Struts and Wires
22	Power bus decoupling on multilayer printed circuit boards
23	A channel model for the residential power circuit used as a digital communications medium
24	An Overview of Lightning Locating Systems: History, Techniques, and Data Uses, With an In-Depth Look at the U.S. NLDN
25	Formulation of the field-to-transmission line coupling equations in terms of magnetic excitation field
26	Electromagnetic interference (EMI) reduction from printed circuit boards (PCB) using electromagnetic bandgap structures
27	Application of the Finite-Difference Time-Domain Method to Sinusoidal Steady-State Electromagnetic-Penetration Problems
28	Wideband frequency-domain characterization of FR-4 and time-domain causality
29	Calculation of Site Attenuation from Antenna Factors
30	The US National Lightning Detection NetworkTM and applications of cloud-to-ground lightning data by electric power utilities
31	Electronic mode stirring for reverberation chambers
32	Introduction to the special issue on high-power electromagnetics (HPEM) and intentional electromagnetic interference (IEMI)
33	Nonorthogonal PEEC formulation for time- and frequency-domain EM and circuit modeling
34	Feature selective validation (FSV) for validation of computational electromagnetics (CEM). part I-the FSV method
35	Frequency Response of Multiconductor Transmission Lines Illuminated by an Electromagnetic Field
36	Radar Cross Section of General Three-Dimensional Scatterers
37	Current and electromagnetic field associated with lightning-return strokes to tall towers
38	Procedures for Determining the Parameters of the First-Order Canonical Models of Class A and Class B Electromagnetic Interference [10]
39	Bandwidth, SAR, and efficiency of internal mobile phone antennas
40	Genetic algorithm design of Pareto optimal broadband microwave absorbers
41	Comparison of electromagnetic absorber used in anechoic and semi-anechoic chambers for emissions and immunity testing of digital devices
42	Noise on Residential Power Distribution Circuits
43	Statistical-Physical Models of Urban Radio-Noise Environments - Part I: Foundations
44	The radiation of a rectangular power-bus structure at multiple cavity-mode resonances
45	EMI from cavity modes of shielding enclosures-FDTD modeling and measurements
46	Canonical and Quasi-Canonical Probability Models of Class a Interference
47	Diagnosis and reduction of conducted noise emissions
48	Theoretical and experimental evaluation of the electromagnetic radiation from apertures in shielded enclosure
49	Finite-difference, time-domain analysis of lossy transmission lines
50	Transient Currents Induced on a Metallic Body of Revolution by an Electromagnetic Pulse

be used for both two-and three-dimensional configurations.

The second paper is the well-known paper by Agrawal, Price and Gurbaxani (Transient Response of Multiconductor Transmission Lines Excited by a Nonuniform Electromagnetic Field, Vol. 22, Nr. 2, 1980) in which an efficient model for the computation of electromagnetic field interaction with multiconductor transmission lines is presented.

Finally, the third most referenced paper is a classic paper by Middleton (Statistical-Physical Models of Electromagnetic Interference, Vol. 19, Nr. 3, 1977) in which the author develops statistical-physical models of electromagnetic interferences.

Table 2 presents another interesting list of the 50 top papers ranked as a function of the average number of citations per year. Interestingly, the same paper (G. Mur, Absorbing Boundary Conditions for the Finite-Differ-

ence Approximation of the Time-Domain Electromagnetic-Field, Vol. 23, No. 4, 1981) appears as the top paper in this list with an average citation count per year of 22. The second paper in this list is a short paper by Zimmermann and Dostert (Analysis and Modeling of Impulsive Noise in Broadband Powerline Communications, Vol. 44, Nr. 1, 2002) in which the authors present an interesting analysis on the noise environment in broadband powerline communications. This paper was on average cited by 21 papers each year. Finally, the third in this list is the paper by Cummins and Murphy (An Overview of Lightning Locating Systems: History, Techniques, and Data Uses, With an In-Depth Look at the U.S. NLDN, Vol. 51, Nr. 3, 2009), cited on average 16 times every year and which appeared in a special issue on lightning. In this paper, the authors describe the history of lightning detection techniques leading to modern lightning location networks.

I hope you enjoy reviewing these tables of notable papers in the 50 year history of the *IEEE Transactions on EMC*. **EMC**

Authors	Publication Year	Volume	Issue	Article Citation Count
Mur, Gerrit	1981	23	4	729
Agrawal, Ashok K.; Price, Harold J.; Gurbaxani, S.H.	1980	22	2	294
Middleton, D.	1977	19	3	268
Zimmermann, M.; Dostert, K.	2002	44	1	256
Luebbers, R.; Hunsberger, F.P.; Kunz, Karl S.; Standler, R.B.; Schneider, M.	1990	32	3	189
Hill, D.A.	1998	40	3	185
Crawford, M.L.	1974	16	4	169
Rakov, V.A.; Uman, M.A.	1998	40	4	165
Kostas, J.G.; Boverie, B.	1991	33	4	131
Rubinstein, M.	1996	38	3	125
Rachidi, F.; Nucci, C.A.; Ianoz, M.; Mazzetti, C.	1996	38	3	125
Umashankar, K.; Taflove, Allen	1982	24	4	123
Hill, D.A.; Ma, M.T.; Ondrejka, A.R.; Riddle, B.F.; Crawford, M.L.; Johnk, R.T.	1994	36	3	120
Robinson, M.P.; Benson, T.M.; Christopoulos, C.; Dawson, J.F.; Ganley, M. D.; Marvin, A.C.; Porter, S.J.; Thomas, D.W.P.	1998	40	3	119
Nucci, C.A.; Rachidi, F.; Ianoz, M.V.; Mazzetti, C.	1993	35	1	114
Schulz, R.B.; Plantz, V.C.; Brush, D.R.	1988	30	3	113
Paul, Clayton R.	1989	31	2	112
Hockanson, D.M.; Drewniak, J.L.; Hubing, T.H.; Van Doren, T.P.; Fei Sha; Wilhelm, M.J.	1996	38	4	104
Van Den Berghe, S.; Olyslager, F.; De Zutter, D.; De Moerloose, J.; Temmerman, W.	1998	40	2	98
Kezhong Zhao; Vouvakis, Marinos N.; Lee, J-F	2005	47	4	96
Holland, R.; Simpson, Larry	1981	23	2	93
Hubing, T.H.; Drewniak, J.L.; Van Doren, T.P.; Hockanson, D.M.	1995	37	2	93
Hooijen, O.G.	1998	40	4	86
Cummins, K.L.; Murphy, M.J.	2009	51	3	84
Rachidi, F.	1993	35	3	83
Shahparnia, S.; Ramahi, Omar M.	2004	46	4	82
Taflove, Allen	1980	22	3	81
Djordjevic A.R.; Biljic, R.M.; Likar-Smiljanic, V.D.; Sarkar, T.K.	2001	43	4	79
Smith, A.A.; German, R.F.; Pate, J.B.	1982	24	3	78
Cummins, K.L.; Krider, E.P.; Malone, M.D.	1998	40	4	78
Hill, D.A.	1994	36	4	76
Radasky, W.A.; Baum, C.E.; Wik, M.W.	2004	46	3	74
Ruehli, A.E.; Antonini, G.; Esch, J.; Ekman, J.; Mayo, A.; Orlandi, A.	2003	45	2	73
Duffy, A.P.; Martin, A.J.M.; Orlandi, A.; Antonini, G.; Benson, T.M.; Woolfson, Malcolm S.	2006	48	3	73
Paul, Clayton R.	1976	18	4	73
Taflove, Allen; Umashankar, K.	1983	25	4	73
Rachidi, F.; Janischewsky, W.; Hussein, A.M.; Nucci, C.A.; Guerrieri, S.; Kordi, B.; Chang, Jen‐Shih	2001	43	3	72
Middleton, D.	1979	21	3	72
Kivekas, Outi; Ollikainen, J.; Lehtiniemi, T.; Vainikainen, P.	2004	46	1	71
Weile, D.S.; Michielssen, E.; Goldberg, D.E.	1996	38	3	70
Holloway, C.L.; DeLyser, R.R.; German, R.F.; McKenna, P.; Kanda, M.	1997	39	1	68
Vines, R.M.; Trissell, H.J.; Gale, L.J.; Ben O'neal, J.	1984	26	4	64
Middleton, D.	1972	14	2	62
Leone, M.	2003	45	3	62
Min Li; Nuebel, Joe; Drewniak, J.L.; DuBroff, R.E.; Hubing, T.H.; Van Doren, T.P.	2000	42	1	59
Middleton, D.	1983	25	2	59
Paul, Clayton R.; Hardin, K.B.	1988	30	4	56
Cerri, G.; De Leo, R.; Primiani, V.M.	1992	34	4	54
Roden, J.A.; Paul, Clayton R.; Smith, W.T.; Gedney, S.D.	1996	38	1	53
Merewether, David E.	1971	13	2	53

Table 2: The 50 papers of the IEEE Transactions on Electromagnetic Compatibility with the highest average citation count per year (1964-2013)

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2	Analysis and modeling of impulsive noise in broad-band powerline communications
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4	Plane wave integral representation for fields in reverberation chambers
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7	Feature selective validation (FSV) for validation of computational electromagnetics (CEM). part I-the FSV method
8	Overview of Power Integrity Solutions on Package and PCB: Decoupling and EBG Isolation
9	Transient Response of Multiconductor Transmission Lines Excited by a Nonuniform Electromagnetic Field
10	Electromagnetic interference (EMI) reduction from printed circuit boards (PCB) using electromagnetic bandgap structures
11	Progress Review of Electromagnetic Compatibility Analysis Technologies for Packages, Printed Circuit Boards, and Novel Interconnects
12	Statistical-Physical Models of Electromagnetic Interference
13	A frequency-dependent finite-difference time-domain formulation for dispersive materials
14	Analytical formulation for the shielding effectiveness of enclosures with apertures
15	Introduction to the special issue on high-power electromagnetics (HPEM) and intentional electromagnetic interference (IEMI)
16	Bandwidth, SAR, and efficiency of internal mobile phone antennas
17	The Electromagnetic Compatibility of Integrated Circuits—Past, Present, and Future
18	Simulating the Multipath Channel With a Reverberation Chamber: Application to Bit Error Rate Measurements
19	Designing and Modeling for Power Integrity
20	Leakage Current Analytical Model and Application in Single-Phase Transformerless Photovoltaic Grid-Connected Inverter
21	Fast Transient Analysis of Next-Generation Interconnects Based on Carbon Nanotubes
22	An approximate formula for the calculation of the horizontal electric field from lightning at close, intermediate, and long range
23	Influence of a lossy ground on lightning-induced voltages on overhead lines
24	Aperture excitation of electrically large, lossy cavities
25	Study of the ground bounce caused by power plane resonances
26	Wideband frequency-domain characterization of FR-4 and time-domain causality
27	Nonorthogonal PEEC formulation for time- and frequency-domain EM and circuit modeling
28	Feature selective validation (FSV) for validation of computational electromagnetics (CEM). part II- assessment of FSV performance
29	Overview of Recent Progress in Lightning Research and Lightning Protection
30	Equivalent Circuit for Electromagnetic Interaction and Transmission Through Graphene Sheets
31	Signal Transmission Analysis of Multilayer Graphene Nano-Ribbon (MLG NR) Interconnects
32	Statistical model for a mode-stirred chamber
33	Lightning-induced voltages on overhead lines
34	Investigation of fundamental EMI source mechanisms driving common-mode radiation from printed circuit boards with attached cables
35	A channel model for the residential power circuit used as a digital communications medium
36	Current and electromagnetic field associated with lightning-return strokes to tall towers
37	The radiation of a rectangular power-bus structure at multiple cavity-mode resonances
38	Analysis of lightning-radiated electromagnetic fields in the vicinity of lossy ground
39	Reflection and transmission properties of a metafilm: with an application to a controllable surface composed of resonant particles
40	Convergence acceleration and accuracy improvement in power bus impedance calculation with a fast algorithm using cavity modes
41	EMI reduction in switched power converters using frequency Modulation techniques
42	Comparisons of computed mobile phone induced SAR in the SAM phantom to that in anatomically correct models of the human head
43	Voltages induced on an overhead wire by lightning strikes to a nearby tall grounded object
44	Modeling Magnetic Radiations of Electronic Circuits Using Near-Field Scanning Method
45	Multilayered Finite-Difference Method (MFDM) for Modeling of Package and Printed Circuit Board Planes
46	Modeling the Electromagnetic Emission of a Microcontroller Using a Single Model
47	Some Parameters of Negative Upward-Initiated Lightning to the Gaisberg Tower (2000–2007)
48	Signal Integrity Design for High-Speed Digital Circuits: Progress and Directions
49	Generation of Standard EM Fields Using TEM Transmission Cells
50	Shielding theory and practice

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	Mur, Gerrit	1981	23	4	729	22
	Zimmermann, M.; Dostert, K.	2002	44	1	256	21
	Cummins, K.L.; Murphy, M.J.	2009	51	3	84	16
	Hill, D.A.	1998	40	3	185	11
	Rakov, V.A.; Uman, M.A.	1998	40	4	165	10
	Kezhong Zhao; Vouvakis, Marinos N.; Lee, J-F	2005	47	4	96	10
	Duffy, A.P.; Martin, A.J.M.; Orlandi, A.; Antonini, G.; Benson, T.M.; Woolfson, Malcolm S.	2006	48	3	73	9
	Tzong-Lin Wu; Hao-Hsiang Chuang; Ting-Kuang Wang	2010	52	2	38	9
	Agrawal, Ashok K.; Price, Harold J.; Gurbaxani, S.H.	1980	22	2	294	8
	Shahparnia, S.; Ramahi, Omar M.	2004	46	4	82	8
	Er-Ping Li; Xing-Chang Wei; Cangellaris, A.C.; En-Xiao Liu; Yao-Jiang Zhang; D'Amore, M.; Joung-ho Kim; Sudo, T.	2010	52	2	32	8
	Middleton, D.	1977	19	3	268	7
	Luebbers, R.; Hunsberger, F.P.; Kunz, Karl S.; Standler, R.B.; Schneider, M.	1990	32	3	189	7
	Robinson, M.P.; Benson, T.M.; Christopoulos, C.; Dawson, J.F.; Ganley, M. D.; Marvin, A.C.; Porter, S.J.; Thomas, D.W.P.	1998	40	3	119	7
	Radasky, W.A.; Baum, C.E.; Wik, M.W.	2004	46	3	74	7
	Kivekas, Outi; Ollikainen, J.; Lehtiniemi, T.; Vainikainen, P.	2004	46	1	71	7
	Ramdani, M.; Sicard, E.; Boyer, A.; Ben Dhia, S.; Whalen, J.J.; Hubing, T.H.; Coenen, M.; Wada, O.	2009	51	1	37	7
	Genender, E.; Holloway, C.L.; Remley, K.A.; Ladbury, J.M.; Koepke, G.; Garbe, H.	2010	52	4	31	7
	Swaminathan, M.; Daehyun Chung; Grivet-Talocia, S.; Bharath, K.; Laddha, V.; Jianyong Xie	2010	52	2	31	7
	Huafeng Xiao; Shaojun Xie	2010	52	4	29	7
	D'Amore, M.; Sarto, M.S.; Tamburrano, A.	2010	52	2	29	7
	Rubinstein, M.	1996	38	3	125	6
	Rachidi, F.; Nucci, C.A.; Ianoz, M.; Mazzetti, C.	1996	38	3	125	6
	Hill, D.A.; Ma, M.T.; Ondrejka, A.R.; Riddle, B.F.; Crawford, M.L.; Johnk, R.T.	1994	36	3	120	6
	Van Den Berghe, S.; Olyslager, F.; De Zutter, D.; De Moerloose, J.; Temmerman, W.	1998	40	2	98	6
	Djordjevic A.R.; Biljic, R.M.; Likar-Smiljanic, V.D.; Sarkar, T.K.	2001	43	4	79	6
	Ruehli, A.E.; Antonini, G.; Esch, J.; Ekman, J.; Mayo, A.; Orlandi, A.	2003	45	2	73	6
	Orlandi, A.; Duffy, A.P.; Archambeault, B.; Antonini, G.; Coleby, D.E.; Connor, S.	2006	48	3	50	6
	Rakov, V.A.; Rachidi, F.	2009	51	3	30	6
	Lovat, G.	2012	54	1	12	6
	Jiang-Peng Cui; Wen-Sheng Zhao; Wen-Yan Yin; Jun Hu	2012	54	1	12	6
	Kostas, J.G.; Boverie, B.	1991	33	4	131	5
	Nucci, C.A.; Rachidi, F.; Ianoz, M.V.; Mazzetti, C.	1993	35	1	114	5
	Hockanson, D.M.; Drewniak, J.L.; Hubing, T.H.; Van Doren, T.P.; Fei Sha; Wilhelm, M.J.	1996	38	4	104	5
	Hooijen, O.G.	1998	40	4	86	5
	Rachidi, F.; Janischewskyj, W.; Hussein, A.M.; Nucci, C.A.; Guerrieri, S.; Kordi, B.; Chang, Jen‐Shih	2001	43	3	72	5
	Leone, M.	2003	45	3	62	5
	Shoory, A.; Moini, R.; Sadeghi, S. H H; Rakov, V.A.	2005	47	1	52	5
	Holloway, C.L.; Mohamed, M.A.; Kuester, Edward F.; Dienstfrey, A.	2005	47	4	50	5
	Zhi Liang Wang; Wada, O.; Toyota, Y.; Koga, R.	2005	47	1	48	5
	Balcells, J.; Santolaria, A.; Orlandi, A.; Gonzalez, D.; Gago, J.	2005	47	3	45	5
	Beard, B.B.; Kainz, W.; Onishi, T.; Iyama, T.; Watanabe, S.; Fujiwara, O.; Jianqing Wang; Bit-Babik, G.; Faraone, A.; Wiart, J.; Christ, A.; Kuster, N.; Ae-Kyoung Lee; Kroeze, H.; Siegbahn, M.; Keshvari, J.; Abrishamkar, H.; Simon, W.; Manteuffel, D.; Nikoloski, N.	2006	48	2	44	5
	Baba, Y.; Rakov, V.A.	2006	48	1	40	5
	Vives-Gilbert, Y.; Arcambal, C.; Louis, A.; De Daran, F.; Eudeline, P.; Mazari, B.	2007	49	2	36	5
	Ege Engin, A.; Bharath, K.; Swaminathan, M.	2007	49	2	36	5
	Labussiere-Dorgan, C.; Bendhia, S.; Sicard, E.; Junwu Tao; Quaresma, H.J.; Lochot, C.; Vrignon, B.	2008	50	1	30	5
	Diendorfer, G.; Pichler, H.; Mair, M.	2009	51	3	25	5
	Jun Fan; Xiaoning Ye; Jingook Kim; Archambeault, B.; Orlandi, A.	2010	52	2	20	5
	Crawford, M.L.	1974	16	4	169	4
	Schulz, R.B.; Plantz, V.C.; Brush, D.R.	1988	30	3	113	4