CURRICULUM VITA

PERSONAL INFORMATION

Name: Edward Francis Kuester

Citizenship: USA

Business Address:

Department of Electrical, Computer and Energy Engineering

425 UCB

University of Colorado

Boulder, CO 80309-0425 USA

Business Phone: (303) 492-5173 **FAX:** (303) 492-2758

email: kuester@schof.colorado.edu

Biographical Summary

Edward F. Kuester was born in St. Louis, Missouri on June 21, 1950. He received the B.S. degree from Michigan State University, East Lansing, in 1971, and the M.S. and Ph.D. degrees from the University of Colorado at Boulder in 1974 and 1976, respectively, all in electrical engineering. Since 1976, he has been with the Department of Electrical, Computer and Energy Engineering at the University of Colorado at Boulder, where he is currently a Professor Emeritus. In 1979, he was a Summer Faculty Fellow at the Jet Propulsion Laboratory, Pasadena, CA. In 1981-1982, he was a Visiting Professor at the Technische Hogeschool, Delft, The Netherlands. In 1992-1993, he was professeur invité at the École Polytechnique Fédérale de Lausanne, Switzerland. In 2002, 2004 and 2006 he was a visiting scientist at the National Institute of Standards and Technology (NIST) in Boulder, CO. His research interests include the modeling of electromagnetic phenomena of guiding and radiating structures, applied mathematics and applied physics. Dr. Kuester has published more than 100 technical papers, co-authored two books, translated two technical books from the Russian and presented numerous papers at technical conferences since 1973. He is co-holder of two US patents. He is a Life Fellow of the IEEE (AP, MTT and EMC Societies), a member of the Society for Industrial and Applied Mathematics, and a member of Commissions B and D of the International Union of Radio Science (URSI).

Education:

Attended Michigan State University, East Lansing, MI, 1967-1971; B.S., Electrical Engineering, June 1971.

Attended University of Colorado, Boulder, 1971-1976; M.S., Electrical Engineering, December 1974; Ph.D., Electrical Engineering, May 1976.

Ph.D. Thesis: ``Radiation and Coupling Properties of Straight and Curved Optical Waveguides", D.C. Chang, thesis advisor.

Scholarships, Fellowships and Visiting Positions:

(Undergraduate) Brunswick Foundation Scholarship, 1967-1971

(Graduate) NSF Traineeship, 1971-1972

(Postgraduate) Summer Faculty Fellowship, Jet Propulsion Laboratory,

Pasadena, California, June-August 1979.

(Postgraduate) Visiting Scientist, Technische Hogeschool Delft,

The Netherlands, August 1981-January 1982.

(Sabbatical Leave) Visiting Professor (Professeur Invité), École Polytechnique Fédérale de Lausanne (EPFL), Laboratoire d'Électromagnetisme et d'Acoustique (LEMA), Switzerland, August 1992-June 1993.

Visiting scientist, National Institute of Standards and Technology (NIST), Boulder, Colorado, May-August 2002, May-August 2004 and January-December 2006.

Foreign Languages:

French and technical Russian read readily; also some reading knowledge of Latin. Some spoken French.

Awards:

United States Department of Commerce, 1998 ITS Outstanding Publication Award for "Net and Partial Inductance of a Microstrip Ground Plane" (with co-author, Chris Holloway).

United States Department of Commerce, 2002 ITS Outstanding Publication Award for "An Investigation into the Geometric Optics Approximation for Indoor Scenarios with a Discussion on Pseudolateral Waves" (with co-authors M. Cotton and C. L. Holloway).

Department of Electrical, Computer and Energy Engineering, University of Colorado at Boulder, 2012 Holland Teaching Award.

IEEE Antennas and Propagation Society, 2013 IEEE Antennas and Propagation Edward E. Altshuler Prize Paper Award for “An overview of the theory and applications of metasurfaces: The two-dimensional equivalents of metamaterials,” (with co-authors C. L. Holloway, J. A. Gordon, J. O'Hara, J. Booth and D. R. Smith).

Co-holder of 2 U. S. patents:

(1) (with C. L. Holloway) “Electromagnetic pyramidal cone absorber with improved low-frequency design,” U. S. patent no. 5,016,185 issued May 14, 1991.
(2) (with H. Gibbons) “Pyramidal absorber having multiple backing layers providing improved low frequency response,” U. S. patent no. 5,331,567 issued July 19, 1994.

PROFESSIONAL SOCIETIES

Life Fellow, IEEE (AP-S, MTT, EMC)

Member, URSI Commissions B and D

Member, Society for Industrial and Applied Mathematics (SIAM)

Member, Eta Kappa Nu

Past Chairman, Denver-Boulder Chapter of IEEE Antennas and Propagation Society, 1979-1980

PREVIOUS EMPLOYMENT

2017-present: Professor Emeritus, University of Colorado, Boulder, Department of Electrical, Computer and Energy Engineering.

1987-2017: Professor, University of Colorado, Boulder

1981-1987: Associate Professor, University of Colorado, Boulder

1979-1981: Assistant Professor, University of Colorado, Boulder

1976-1978: Research Associate with Attendant Rank of Assistant Professor, University of Colorado, Boulder

1972-1976: Research Assistant, University of Colorado, Boulder

1974-1975: Teaching Associate, University of Colorado, Denver, Department of Electrical Engineering.

Summer 1970: Engineering Assistant, General Telephone of Michigan, Muskegon.

RESEARCH INTERESTS

Theoretical investigations in all areas of electromagnetic wave theory, and in several areas of applied mathematics. Specific topics of interest include propagation along open guiding structures, antennas, remote sensing using electromagnetic waves, numerical modeling of planar microwave circuits, electromagnetic compatibility, metamaterials and fundamental limits in impedance matching.

PROFESSIONAL ACTIVITIES

• Faculty Advisor, Rho Chapter of Eta Kappa Nu, 1979-1985.
• Served on Steering Committee organizing the National Radio Science Meetings at Boulder, 1978-1980.
• Session Chair, National Radio Science Meetings, 1979, 1985, 1986, 1995, 1999.
• Session Chair, International Microwave Symposium, May 1980, Washington, D.C.
• Reviewer for IEEE Transactions on AP, EMC, MTT, GRS; Optical Society of America; Radio Science; Journal of Electromagnetic Waves and Applications; Electronics Letters; Journal of Computational Physics.
• Past Associate Editor, IEEE Transactions on EMC.
• Chair, Steering Committee, January 1995 and January 1996 URSI National Radio Science Meetings, Boulder, Colorado.
• Past Associate Editor, IEEE Transactions on Antennas and Propagation.
• Member, External Advisory Board, Sandia National Laboratories Metamaterials Grand Challenge Project, 2008-2011.

E. F. KUESTER: LIST OF PUBLICATIONS

Books and Book Chapters

(1) *Electromagnetic Waves and Curved Structures* (with L. Lewin and D.C. Chang). London: Peter Peregrinus, 1977.
(2) *The Boundary Layer Method in Diffraction Problems*, by V.M. Babić and N. Ya. Kirpićnikova (translated from the Russian). Berlin: Springer-Verlag, 1979.
(3) "Imaging and propagation of beams in metallic or dielectric waveguides," (with D.C. Chang), in *Hybrid Formulation of Wave Propagation and Scattering*, (L.B. Felsen, ed.). Dordrecht, The Netherlands: Martinus Nijhoff, 1984, pp. 185-194.
(4) "Time-domain Weyl plane-wave representation for wave functions," (with A.G. Tijhuis), in *Hybrid Formulation of Wave Propagation and Scattering* (L.B. Felsen, ed.). Dordrecht, The Netherlands: Martinus Nijhoff, 1984, pp. 285-292.
(5) *Short-Wavelength Diffraction Theory*, by V.M. Babić and V.S. Buldyrev (translated from the Russian). Berlin: Springer-Verlag, 1991.
(6) "Electromagnetic Wave Propagation," (with D.C. Chang) in *Encyclopedia of Applied Physics*, vol. 5, VCH Publishers, 1993, pp. 379-404.
(7) "Impedance Matching, Broadbanding and Baluns," (with D. F. Bowman) in *Antenna Engineering Handbook*, 4th edition (J. L. Volakis, ed.). New York: McGraw-Hill, 2007, chapter 52.
(8) *Electromagnetic Boundary Problems* (with D.C. Chang). Boca Raton, FL: CRC Press, 2016.
(9) "Impedance Matching, Broadbanding and Baluns," (with D. F. Bowman) in *Antenna Engineering Handbook*, 5th edition (J. L. Volakis, ed.). New York: McGraw-Hill, 2019, chapter 55.
(10) "Using Generalized Sheet Transition Conditions (GSTCs) in the Analysis of Metasurfaces," (with C. L. Holloway) in *Surface Electromagnetics: With Applications in Antenna, Microwave, and Optical Engineering* (F. Yang and Y. Rahmat-Samii, eds.). Cambridge, UK: Cambridge University Press, 2019, chapter 3.
(11) *Theory of Waveguides and Transmission Lines*. Boca Raton, FL: CRC Press, 2020.
(12) "Electromagnetic metamaterials and metasurfaces: Historical overview, characterization, and the effect of length scales," (with C. L. Holloway) in *Dielectric Metamaterials: Fundamentals, Designs, and Applications* (I. Brener, ed.). Duxford, UK: Woodhead Publishing, 2020, chapter 1.

Preprints

1. "Sensitivity of double-sided split ring resonator arrays to fabrication tolerances," (with F. Trang and Z. Popović) https://arxiv.org/abs/1207.4211 .
2. "The effect of inhomogeneous dielectric loading on transmission through a slot in an infinite thick metallic shield," (with A. H. Haddab) https://arxiv.org/abs/1904.10326 .
3. "Average transition conditions for electromagnetic fields at a metascreen of vanishing thickness," (with E. Liu and N. Krull) https://arxiv.org/abs/1905.05869.

4. “Average transition conditions for electromagnetic fields at a metascreen of nonzero thickness,” (with E. Liu) https://arxiv.org/abs/1905.05871 .
5. “Investigation of the solution of a system of partial differential equations with periodic coefficients,” by A. Potier (translated by E. F. Kuester) https://arxiv.org/abs/2211.02568 .

Journal Publications

1. "Propagation, attenuation and dispersion characteristics of inhomogeneous dielectric slab waveguides," (with D.C. Chang), *IEEE Trans. Micr. Theory Tech*, vol. 23, pp. 98-106 (1975).
2. "Nondegenerate surface-wave mode coupling between dielectric waveguides," (with D.C. Chang), *IEEE Trans. Micr. Theory Tech*, vol. 23, pp. 877-882 (1975).
3. "Single-mode pulse dispersion in optical waveguides," (with D.C. Chang), *IEEE Trans. Micr. Theory Tech*, vol. 23, pp. 882-887 (1975).
4. "Surface-wave radiation loss from curved dielectric slabs and fibers," (with D.C. Chang), *IEEE J. Quant. Electron*., vol. 11, pp. 903-907 (1975).
5. "Radiation and propagation of a surface-wave mode on a curved open waveguide of arbitrary cross-section," (with D.C. Chang), *Radio Science*, vol. 11, pp. 449-457 (1976).
6. "An alternative expression for the curvature loss of a dielectric waveguide and its application to the rectangular dielectric channel," *Radio Science*, vol. 12, pp. 573-578 (1977).
7. "Scattering of a surface wave from a curvature discontinuity on a convex impedance surface," (with D.C. Chang), *IEEE Trans. Antennas Prop*., vol. 25, pp. 796-801 (1977).
8. "Propagating modes along a thin wire located above a grounded dielectric slab," (with D.C. Chang), *IEEE Trans. Micr. Theory Tech*., vol. 25, pp. 1065-1069 (1977).
9. "Modal theory of a long horizontal wire structure above the earth, 1, Excitation," (with D.C. Chang and R.G. Olsen), *Radio Science*, vol. 13, pp. 605-613 (1978).
10. "Modal theory of long horizontal wire structures above the earth, 2, Properties of discrete modes," (with R.G. Olsen and D.C. Chang), *Radio Science*, vol. 13, pp. 615-623 (1978).
11. "An appraisal of methods for computation of the dispersion characteristics of open microstrip," (with D.C. Chang), *IEEE Trans. Micr. Theory Tech*., vol. 27, pp. 691-694 (1979).
12. “Further comments on `Dielectric-waveguide-modal properties: A new analysis of the one-dimensional wave equation',” *IEEE J. Quant. Electron*., vol. 15, p. 664 (1979).
13. "Low-frequency behavior of the propagation constant along a thin wire in an arbitrarily shaped mine tunnel," (with D.B. Seidel), *IEEE Trans. Micr. Theory Tech*., vol. 27, pp. 736-741 (1979).
14. "An analytic theory for narrow open microstrip," (with D.C. Chang), *Arch. Elek. . Ubertragungstech*., vol. 33, pp. 199-206 (1979).

15. "Fundamental mode propagation on dielectric fibres of arbitrary cross-section," (with R.C. Pate), *IEE Proc.*, vol. 127, part H, pp. 41-51 (1980).
16. "Closed-form expressions for the current or charge distribution on parallel strips or microstrip," (with D.C. Chang), *IEEE Trans. Micr. Theory Tech.*, vol. 28, pp. 254-259 (1980).
17. "Theory of dispersion in microstrip of arbitrary width," (with D.C. Chang), *IEEE Trans. Micr. Theory Tech.*, vol. 28, pp. 259-265 (1980).
18. "Addendum to `Closed-form expressions for the current or charge distribution on parallel strips or microstrip'," (with D.C. Chang), *IEEE Trans. Micr. Theory Tech.*, vol. 28, p. 1143 (1980).
19. "Imaging and coupling in parallel multimode dielectric slab waveguides," (with S. Dow and D. C. Chang), *Proc. SPIE*, vol. 239, pp. 80-83 (1980).
20. "Total and partial reflection from the end of a parallel-plate waveguide with an extended dielectric slab," (with D.C. Chang), *Radio Science*, vol. 16, pp. 1-13 (1981).
21. "A hybrid method for paraxial beam propagation in multimode optical waveguides," (with D.C. Chang), *IEEE Trans. Micr. Theory Tech.*, vol. 29, pp. 923-933 (1981).
22. "Electromagnetic wave propagation along horizontal wire systems in or near a layered earth," (with D.C. Chang and S.W. Plate), *Electromagnetics*, vol. 1, pp. 243-265 (1981).
23. "Radiation loss from a dielectric channel waveguide bend," (with D. C. Chang and R. Holland), *Proc. SPIE*, vol. 317, pp. 101-106 (1981).
24. "The thin-substrate approximation for reflection from the end of a slab-loaded parallel-plate waveguide with application to microstrip patch antennas," (with R.T. Johnk and D.C. Chang), *IEEE Trans. Ant. Prop.*, vol. 30, pp. 910-917 (1982).
25. "Coupling and imaging of Gaussian beams in parallel dielectric slab waveguides," (with G.S. Dow and D.C. Chang), *Arch. Elek. . Ubertragungstech.*, vol. 36, pp. 427-435 (1982).
26. "A geometrical theory for the resonant frequencies and Q-factors of some triangular microstrip patch antennas," (with D.C. Chang), *IEEE Trans. Ant. Prop.*, vol. 31, pp. 27-34 (1983).
27. "Propagation constants for linearly polarized modes of arbitrarily shaped optical fibers or dielectric waveguides," *Optics Letters*, vol. 8, pp. 192-194 (1983).
28. "Accurate approximations for a function appearing in the analysis of microstrip," *IEEE Trans. Micr. Theory Tech.*, vol. 32, pp. 131-133 (1984).
29. "Generalisation of the partial-power law (Brown's identity) to waveguides with lossy media," *Electronics Letters*, vol. 20, pp. 456-457 (1984).
30. "The effective cross-section method for dielectric waveguides in or on a substrate," *Radio Science*, vol. 19, pp. 1239-1244 (1984).
31. "The transient electromagnetic field of a pulsed line source located above a dispersively reflecting surface," *IEEE Trans. Ant. Prop.*, vol. 32, pp. 1154-1162 (1984).

32. "A fast-field program for sound propagation in a layered atmosphere above an impedance ground", (with R. Raspet, S.W. Lee, D.C. Chang, W.F. Richards, R. Gilbert and N. Bong), *J. Acoust. Soc. Amer*., vol. 77, pp. 345-352 (1985).
33. "Geometrical theory of a one-dimensional microstrip resonator: The effect of topside charges and currents," (with D.C. Chang and A.R. Mahnad), *Radio Science*, vol. 20, pp. 819-826 (1985).
34. "Virial theorems for electromagnetic fields," *Internat. J. Electron*., vol. 61, pp. 583-596 (1986).
35. "Comments on `Correction of Maxwell's equations for signals I', `Correction of Maxwell's equations for signals II', and `Propagation velocity of electromagnetic signals'," *IEEE Trans. Electromag. Compat*., vol. 29, pp. 187-190 (1987).
36. "Explicit approximations for the static capacitance of a microstrip patch of arbitrary shape," *J. Electromag. Waves Appls*., vol. 2, pp. 103-135 (1987).
37. "Accurate analysis of arbitrarily shaped patch resonators on thin substrates," (with T.M. Martinson), *IEEE Trans. Micr. Theory Tech*., vol. 36, pp. 324-331 (1988).
38. "A hybrid method for solving time domain integral equations in transient scattering problems," (with A.G. Tijhuis and R. Wiemans), *J. Electromag. Waves Appl*., vol. 3, pp. 485-511 (1989).
39. "The edge admittance of a wide microstrip patch as seen by an obliquely incident wave," (with T.M. Martinson and D.C. Chang), *IEEE Trans. Ant. Prop*., vol. 37, pp. 413-417 (1989).
40. "Numerical computation of the incomplete Lipschitz-Hankel integral $Je_0(a; z)$," (with S. L. Dvorak), *J. Comp. Phys*., vol. 87, pp. 301-327 (1990).
41. "A generalized edge boundary condition for open microstrip structures," (with T.M. Martinson), *J. Electromag. Waves Appl*., vol. 4, pp. 273-295 (1990).
42. "Strip edge shape effects on conductor loss calculations using the Lewin/Vainshtein method," (with E.L. Barsotti and J.M. Dunn), *Electron. Lett*., vol. 26, pp. 983-985 (1990).
43. "Effect of metallization edge shape on conductor loss of open coplanar waveguide," (with E.L. Barsotti and J.M. Dunn), *Micr. Opt. Technol. Lett*., vol. 3, pp. 389-391 (1990).
44. "Comparisons of approximations for effective parameters of artificial dielectrics," (with C.L. Holloway), *IEEE Trans. Micr. Theory Tech*., vol. 38, pp. 1752-1755 (1990).
45. "Homogenization analysis of electromagnetic strip gratings," (with R. R. DeLyser), *J. Electromagnetic Waves Applications*, vol. 5, pp. 1217-1236 (1991).
46. "A new method for computing the reaction between two rooftop basis functions in a planar structure," (with S. L. Dvorak), *International J. Microwave Millimeter-Wave Computer-Aided Engineering*, vol. 1, pp. 333-345 (1991).
47. "A simple method to account for the edge shape in the conductor loss in microstrip," (with E. L. Barsotti and J. M. Dunn) *IEEE Trans. Microwave Theory Techniques*, vol. 39, pp. 98-106 (1991).
48. "Numerical computation of 2D Sommerfeld integrals - Decomposition of the angular integral," (with S. L. Dvorak) *J. Comp. Phys*., vol. 98, pp. 189-216 (1992).

49. "Numerical computation of 2D Sommerfeld integrals - A novel asymptotic extraction technique," (with S. L. Dvorak) *J. Comp. Phys*., vol. 98, pp. 217-230 (1992).
50. "Design of log periodic strip grating microstrip antenna," (with R.R. DeLyser and D.C. Chang), *Int. J. Microwave Millimeter-Wave Computer-Aided Eng*., vol. 3, pp. 143-150 (1993).
51. "Edge shape effects and quasi-closed form expressions for the conductor loss of microstrip lines," (with C. L. Holloway) *Radio Science*, vol. 29, pp. 539-559 (1994).
52. "Guided waves along a metal grating on the surface of a grounded dielectric slab," (with F. Bellamine) *IEEE Trans. Microwave Theory and Techniques*, vol. 42, pp. 1190-1197 (1994).
53. "A low-frequency model for wedge or pyramid absorber arrays-I: Theory," (with C. L. Holloway) *IEEE Trans. Electromagnetic Compatibility*, vol. 36, pp. 300-306 (1994).
54. "A low-frequency model for wedge or pyramid absorber arrays-II: Computed and measured results," (with C. L. Holloway) *IEEE Trans. Electromagnetic Compatibility*, vol. 36, pp. 307-313 (1994).
55. "Computable error bounds for variational functionals of solutions of a convolution integral equations of the first kind," *Wave Motion*, vol. 22, pp. 171-185 (1995).
56. "Closed-form expressions for the current density on the ground plane of a microstrip line, with application to ground plane loss," (with C. L. Holloway) *IEEE Trans. Microwave Theory and Techniques*, vol. 43, pp. 1204-1207 (1995).
57. "A quasi-closed form expression for the conductor loss of CPW lines, with an investigation of edge shape effects," (with C. L. Holloway) *IEEE Trans. Microwave Theory and Techniques*, vol. 43, pp. 2695-2701 (1995).
58. "Modeling semi-anechoic electromagnetic measurement chambers," (with C. L. Holloway) *IEEE Trans. Electromagnetic Compatibility*, vol. 38, pp. 79-84 (1996).
59. "Net and partial inductance of a microstrip ground plane," *IEEE Trans. Electromagnetic Compatibility*, vol. 40, pp. 33-46 (1998).
60. "Equivalent boundary conditions for a perfectly conducting periodic surface with a cover layer," (with C. L. Holloway) *Radio Science*, vol. 35, pp. 661-681 (2000).
61. "Power loss associated with conducting and superconducting rough interfaces," (with C. L. Holloway) *IEEE Trans. Microwave Theory and Techniques*, vol. 48, pp. 1601-1610 (2000).
62. "Impedance-type boundary conditions for a periodic interface between a dielectric and a highly conducting medium," (with C. L. Holloway) *IEEE Trans. Antennas and Propagation*, vol. 48, pp. 1660-1672 (2000).
63. “An investigation into the geometric optics approximation for indoor scenarios with a discussion on pseudolateral waves,” (with M. G. Cotton and C. L. Holloway) *Radio Science*, vol. 37, pp. 1-1 to 1-20 (2002).
64. “A double negative (DNG) composite medium composed of magnetodielectric spherical particles embedded in a matrix,” (with C. L. Holloway, J. Baker-Jarvis and P. Kabos) *IEEE Trans. Ant. Prop.*, vol. 51, pp. 2596-2603 (2003).

65. “Averaged transition conditions for electromagnetic fields at a metafilm,” (with M. A. Mohamed, M. Piket-May and C. L. Holloway) *IEEE Trans. Ant. Prop.*, vol. 51, pp. 2641-2651 (2003).
66. "Effective electromagnetic properties of honeycomb composites, and hollow-pyramidal and alternating-wedge absorbers," (with M. Johansson and C. L. Holloway) *IEEE Trans. Ant. Prop.*, vol. 53, pp. 728-736 (2005).
67. "An orthogonality-based de-embedding technique for microstrip networks," (with M. P. Spowart) *IEEE Trans. Micr. Theory Tech.*, vol. 53, pp. 938-946 (2005).
68. "Guaranteed passive direct lumped-element modeling of transmission lines," (with Se-Ho You) *IEEE Trans. Micr. Theory Tech.*, vol. 53, pp. 2826-2834 (2005).
69. “Reflection and transmission properties of a metafilm: With an application to a controllable surface composed of resonant particles,” (with C. L. Holloway, M. A. Mohamed and A. Dienstfrey) *IEEE Trans. Electromag. Compat.*, vol. 47, pp. 853-865 (2005).
70. “Fast and direct coupled-microstrip interconnect reduced-order modeling based on the finite-element method,” (with Se-Ho You) *IEEE Transactions on Microwave Theory and Techniques*, vol. 54, pp. 2232-2242 (2006).
71. “A novel asymptotic extraction technique for the efficient evaluation of a class of double Sommerfeld integrals,” (with M. P. Spowart) *Journal of Computational and Applied Mathematics*, vol. 197 pp. 597-611 (2006).
72. “Closed-form expressions for the current densities on the ground planes of asymmetric stripline structures,” (with C. L. Holloway) *IEEE Transactions on Electromagnetic Compatibility*, vol. 49, pp. 49-57 (2007).
73. “Optimizing arrays of randomly placed wireless transmitters for receivers located within the array volume,” (with W. F. Young and C. L. Holloway) *IEEE Transactions on Antennas and Propagation*, vol. 55, pp. 698-706 (2007).
74. “Bandwidth control of forbidden transmission gaps in compound structures with subwavelength slits,” (with D. C. Skigin, Hung Loui and Z. Popovic) *Physical Review E*, vol. 76, pp. 016604-1-6 (2007).
75. “Sub-wavelength resonators: on the use of metafilms to overcome the $\lambda/2$ size limit,” (with C. L. Holloway, D. C. Love, A. Salandrino, and N. Engheta) *IET Microwaves, Antennas & Propagation*, vol. 2, pp. 120-129 (2008).
76. “Measurements of randomly placed wireless transmitters used as an array for receivers located within the array volume with application to emergency responders,” (with W. F. Young and C. L. Holloway) *IEEE Transactions on Antennas and Propagation*, vol. 57, pp. 241-247 (2009).
77. “Extracting the bulk effective parameters of a metamaterial via the scattering from a single planar array of particles,” (with A. D. Scher) *Metamaterials*, vol. 3, pp. 44-55 (2009).
78. “DC internal inductance for a conductor of rectangular cross section,” (with C. L. Holloway) *IEEE Transactions on Electromagnetic Compatibility*, vol. 51, pp. 338-344 (2009).

79. “Boundary effects in the electromagnetic response of a metamaterial in the case of normal incidence,” (with A. D. Scher) *Progress in Electromagnetics Research B*, vol. 14, pp. 341-381 (2009).
80. “Waveguides composed of metafilms/metasurfaces: The two-dimensional equivalent of metamaterials,” (with C. L. Holloway and D. Novotny) *IEEE Antennas and Wireless Propagation Letters*, vol. 8, pp. 525-529 (2009).
81. “The field of an electric dipole and the polarizability of a conducting object embedded in the interface between dielectric materials,” (with M. A. Mohamed, M. Piket-May and C. L. Holloway) *Progress in Electromagnetics Research B*, vol. 16, pp. 1-20 (2009).
82. “A discussion on the interpretation and characterization of metafilms/metasurfaces: The two-dimensional equivalent of metamaterials,” (with C. L. Holloway, A. Dienstfrey, J. F. O’Hara, A. K. Azad and A. J. Taylor) *Metamaterials*, vol. 3, pp. 100-112 (2009).
83. “Direct synthesis of passband impedance matching with nonuniform transmission lines,” (with Yao-Wen Hsu) *IEEE Transactions on Microwave Theory and Techniques*, vol. 58, pp. 1012-1021 (2010).
84. “Realisation of a controllable metafilm/metasurface composed of resonant magnetodielectric particles: Measurements and theory,” (with C. L. Holloway, P. Kabos, M. A. Mohamed, J. A. Gordon, M. D. Janezic and J. Baker-Jarvis) *IET Microwaves, Antennas & Propagation*, vol. 4, pp. 1111-1122 (2010).
85. “The electromagnetic response of a metamaterial slab in the case of normal incidence,” (with A. D. Scher) *Progress in Electromagnetics Research B*, vol. 30, pp. 1-26 (2011).
86. “A negative refractive index metamaterial based on a cubic array of layered nonmagnetic spherical particles,” (with N. Memić, S. Shen, A. Scher, S. Kim, K. Kumley and H. Loui) *Progress in Electromagnetics Research B*, vol. 33, pp. 175-202 (2011).
87. “Boundary effects on the determination of metamaterial parameters from normal incidence reflection and transmission measurements,” (with S. Kim, C. L. Holloway, A. D. Scher and J. Baker-Jarvis) *IEEE Transactions on Antennas and Propagation*, vol. 59, pp. 2226-2240 (2011).
88. “Characterizing metasurfaces/metafilms: The connection between surface susceptibilities and effective material properties,” (with C. L. Holloway and A. Dienstfrey) *IEEE Antennas and Wireless Propagation Letters*, vol. 10, pp. 1507-1511 (2011).
89. “Effective material property extraction of a metamaterial by taking boundary effects into account at TE/TM polarized incidence,” (with S. Kim, C. L. Holloway, A. D. Scher and J. R. Baker-Jarvis) *Progress in Electromagnetics Research B*, vol. 36, pp. 1-33 (2012).
90. “An overview of the theory and applications of metasurfaces: The two-dimensional equivalents of metamaterials,” (with C. L. Holloway, J. A. Gordon, J. O'Hara, J. Booth and D. R. Smith) *IEEE Antennas and Propagation Magazine*, vol. 54, no. 2, pp. 10-35 (2012).

91. “A lower bound for the length of nonuniform transmission line matching sections,” *AEU - International Journal of Electronics and Communications*, vol. 66, no. 12, pp. 1011-1016 (2012); corrigendum, ibid., vol. 70, p. 120 (2016).
92. “Use of generalized sheet transition conditions to model guided waves on metasurfaces/metafilms,” (with C. L. Holloway, D. C. Love, J. A. Gordon and D. A. Hill) *IEEE Transactions on Antennas and Propagation*, vol. 60, pp. 5173-5186 (2012).
93. “A frequency-bandgap waveguide controlled with metafilms composed of cubic particles,” (with S. Kim, C. L. Holloway, K. L. Kumley, M. D. Janezic and J. Baker-Jarvis) *Journal of Applied Physics*, vol. 112, art. 104904 (2012).
94. “The field of a magnetic dipole and the polarizability of a superconducting object embedded in the interface between magnetic materials,” (with M. A. Mohamed and M. C. E. Yagoub) *Progress in Electromagnetics Research B*, vol. 46, pp. 101-118 (2013).
95. “Partial and internal inductance: Two of Clayton R. Paul's many passions,” (with C. L. Holloway, A. E. Ruehli and G. Antonini) *IEEE Transactions on Electromagnetic Compatibility*, vol. 55, pp. 600-613 (2013).
96. “Corrections to the classical continuity boundary conditions at the interface of a composite medium,” (with C. L. Holloway) *Photonics and Nanostructures – Fundamentals and Applications*, vol. 11, pp. 397-422 (2013).
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