

CONSTANTINE A. BALANIS, Ph.D.

Regents' Professor
School of Electrical, Computer and Energy Engineering
Arizona State University
Tempe, AZ 85287-5706

Telephone: (480) 965-3909; FAX: (480) 965-8325

E-mail: balanis@asu.edu
WWW: <http://balanis.faculty.asu.edu>

Date and Place of Birth: October 29, 1938 (Trikala, Greece)

Citizenship: U.S.A. (1960)

Marital Status: Married and Two Children

Hobbies: Golf, Jogging

Education:

1. PhD (Electrical Engineering), Ohio State University, June 1969.
2. Master of Electrical Engineering, University of Virginia, August 1966.
3. Bachelor of Science in Electrical Engineering, Virginia Tech, June 1964.
4. Honorary Doctorate, Aristotle University of Thessaloniki (AUTH), June 2004.

Professional Experience:

Academic:

1. August 1983 - Present:
Arizona State University
Tempe, AZ 85287-5706
 - a. July 1991-Present: Regents' Professor
School of Electrical, Computer and Energy Engineering
 - b. August 1988 - 1999: Director, Telecommunications Research Center
Fulton Schools of Engineering
 - c. August 1983-June 1990: Professor
School of Electrical, Computer and Energy Engineering
2. August 1970 - August 1983
Department of Electrical Engineering
West Virginia University
Morgantown, WV 26506-6101
 - a. August 1970 - August 1972: Visiting Associate Professor
 - b. August 1972 - August 1976: Associate Professor
 - c. August 1976 - August 1983: Professor

3. September 1968 - August 1970: Assistant Professorial Lecturer
George Washington University Extension
NASA-Langley Research Center
Hampton, VA 23681-0001

Government-Industry:

1. June 1964 - August 1970: Electronics Engineer
NASA Langley Research Center
Hampton, VA 23665
2. June - August 1963: Engineer-in-Training
Bell Laboratories
Winston-Salem, NC

Honors and Awards:

I. IEEE Related

1. Life Fellow, 2004, Institute of Electrical and Electronics Engineers (IEEE).
2. 2017 IEEE Rudolph E. Henning Distinguished Mentoring Award
3. 2012 Distinguished Achievement Award, IEEE AP Society.
4. 2005 IEEE Chen-To Distinguished Educator Award (AP Society).
5. The IEEE Third Millennium Medal (2000).
6. 1989 IEEE Region 6 Individual Achievement Award "In recognition for continued outstanding leadership to IEEE and dedicated service to his profession as an author and practicing engineer."
7. 1992 Special Professionalism Award, IEEE Phoenix Section "For the establishment and promotion of the highest standards for Electrical Engineering Education through creative and original research, professional service, faculty development, curriculum, teaching and accreditation."
8. 1994 Best Paper Award, *IEEE Trans. Electromagnetic Compatibility*, Vol. 35, No. 2, pp. 192-203, May 1993.

II. Non IEEE Related

1. Honorary Doctorate, Aristotle University of Thessaloniki, Thessaloniki, Greece, 2004.
2. Regents' Professor, Arizona State University, 1991.
3. 2014 LAPC James R. James Lifetime Achievement Award (UK),
4. 2012, Distinguished Achievement Alumnus Award, College of Engineering, The Ohio State University.
5. Outstanding Graduate Mentor Award, Arizona State University, 1996.
6. Graduate Teaching Excellence Award, School of Engineering, Arizona State University, 1987-88.
7. Distinguished Achievement Award, College of Engineering and Applied Sciences, Arizona State University, 1991.

8. Outstanding Researcher, College of Engineering, West Virginia University
 - a. 1980-81
 - b. 1981-82
 - c. 1982-83
9. Halliburton Best Researcher Award, College of Engineering, West Virginia University 1982-83
10. "1984 Russ Award for Research", Ohio University recognizing best refereed journal paper by R. D. Radcliff, C. A. Balanis and H. W. Hill published in the IEEE Trans. Geoscience and Remote Sensing, Vol. GE-32, pp. 698-703, Nov. 1984.
11. 1976 William E. Jackson Memorial Award, sponsored by the Radio Technical Commission for Aeronautics (RTCA) for Master's Thesis entitled "Analysis of Aircraft Antenna Radiation for Microwave Landing System" by Yuk-Bun Cheng.

Membership in Scientific and Professional Societies:

1. Eta Kappa Nu, Tau Beta Pi, Phi Kappa Phi, Sigma Xi
2. Institute of Electrical and Electronics Engineers (Life Fellow)
 - a. AP-S, IEEE Antennas and Propagation Society
 - b. GRS-S, IEEE Geoscience & Remote Sensing Society
 - c. MTT-S, IEEE Microwave Theory and Techniques Society
 - d. EE-S, IEEE Engineering Education Society
 - e. EMC-S, Electromagnetic Compatibility Society
3. Electromagnetics Academy
4. American Society for Engineering Education
5. Radio Technical Commission for Aeronautics (RTCA SC-121)

Listed in:

- a. Who's Who in America
- b. Who's Who in the East
- c. Who's Who in the South and Southwest
- d. Who's Who in Electromagnetics
- e. American Men and Women of Science
- f. Dictionary of International Biography (British)
- g. Men of Achievement (British)
- h. Who's Who in Engineering
- i. Who's Who in 1979 (Greek)
- j. The American Hellenic Who's Who in Business and the Profession
- k. Who's Who in Technology Today
- l. International Who's Who in Engineering (British)

Professional Activities:

1. Editor: *Newsletter* of IEEE Geoscience and Remote Sensing Society (1/1/82-12/31/83)
2. Associate Editor:
 - a. *IEEE Trans. Antennas & Propagation* (7/1/74-6/30/77)
 - b. *IEEE Trans. Geoscience & Remote Sensing* (1/1/81-12/31/84)
3. Editor: Morgan & Claypool Publishers
 - a. *Antennas and Propagation Series*
 - b. *Computational Electromagnetics Series*
4. Technical Reviewer:
 - a. IEEE Trans. on Antennas and Propagation
 - b. IEEE Trans. on Geoscience & Remote Sensing
 - c. IEEE Trans. on Microwave Theory and Tech.
 - d. IEEE Trans. on Electromagnetic Compatibility
 - e. IEEE Trans. on Systems, Man and Cybernetics
 - f. IEEE Trans. on Vehicular Technology
 - g. IEEE Trans. on Education
 - h. IEEE Antennas and Wireless Propagation Letters
 - i. IEEE Microwave and Guided Wave Letters
 - j. Proceedings of the IEEE
 - k. IEE Proceedings
 - l. Journal of EM Waves and Applications
 - m. Microwave and Optical Technology Letters
 - n. Radio Science
 - o. Electronics Letters
 - p. Journal of Applied Physics
 - q. Astronautics and Aeronautics
 - r. Fuel
 - s. National Science Foundation
 - t. Army Research Office
 - u. Harper & Row, Publishers, Inc.
 - v. John Wiley & Sons, Publishers
 - w. Prentice-Hall, Publishers, Inc.
 - x. Artech House Publishers, Inc.
5. Administrative Committees
 - a. Member, IEEE Geoscience and Remote Sensing Society
 - b. Vice-President, IEEE Geoscience and Remote Sensing Society
 - c. Conference Coordinator, IEEE Geoscience and Remote Sensing Society
 - d. Chairman, Distinguished Lecturer Program, IEEE Antennas Propagat. Society
 - e. Distinguished Lecturer, IEEE Antennas Propagat. Society
 - f. Member, IEEE Antennas and Propagation Society

6. Conference Committees:
 - a. Technical Committee; 1972, 1990, 1992, 1993, 1994, 1999, 2000 and 2003
 - b. International IEEE Symposium on Antennas and Propagation
 - c. Steering Committee, Sixth WVU Conference on Coal Mine Electro-technology
 - d. Technical Committee of 1987 and 1990 International IEEE Geoscience
 - e. and Remote Sensing Society Symposium

7. Session Chairman for:
 - a. SOUTHEASTCON '79, '81
 - b. 1981, 1987 - 2004 International IEEE Antennas and Propagation Society Symposium
 - c. 1986, 1987, 1988 International IEEE Geoscience Remote Sensing Society Symp.

8. People-to-People Aeronautical Telecommunications Delegation, People's Republic of China, April 14 - May 5, 1983.

9. Federal Aviation Administration (FAA) Ad Hoc Committee on MLS Antenna Polarization Selection.

10. General Electric Management Development Institute (of invited Engineering Professors), June 30 - July 1, 1980.

11. Faculty Advisor of Eta Kappa Nu, Electrical Engineering Honorary at West Virginia University (1972-83)

12. IEEE Upper Monongahela Subsection:
 - a. Delegate-at-Large (1974-75)
 - b. Secretary Treasurer (1975-76)
 - c. Vice-Chairman (1976-77)
 - d. Chairman (1977-78)

13. Sigma Xi and The Research Society of North America (West Virginia U. Chapter):
 - a. Secretary (1976-77)
 - b. Vice-Chairman (1977-78)
 - c. Chairman (1978-79)

14. Phi Kappa Phi Honor Society (West Virginia University Chapter):
 - a. Public Relations Officer (1976-77)
 - b. Vice President (1977-78)
 - c. President (1978-79)

Consulting Experience:

- a. Motorola, Inc.
Scottsdale, AZ
- b. Boeing Company
Seattle, WA
- c. Rockwell International
Cedar Rapids, IA
- d. Loral Defense Systems (formerly Goodyear Aerospace)
Litchfield Park, AZ
- e. General Dynamics
Pomona, CA
- f. Naval Surface Weapons Center (NSWC)
Dahlgren, Virginia
- g. Naval Air Warfare Center (NAWC)
Patuxent River, Maryland
- h. U. S. Army, CERDEC
Ft. Monmouth, NJ
- i. Southwest Research Institute
San Antonio, Texas
- j. National Radio Astronomy Observatory (NRAO)
Green Bank, West Virginia
Charlottesville, Virginia
- k. National Institute for Occupational Safety and Health (NIOSH)
Morgantown, WV
- l. Federal Aviation Administration
Reston, VA
- m. EG&G
Las Vegas, NV
- n. Navair
Cherry Point, NC
- o. Lockheed of California
Burbank, CA
- p. GE Astro Space Division
Princeton, NJ

Patents:

1. "Electromagnetic Wave Method for Mapping Subterranean Earth Formations," Patent No. 4,045,724; August 30, 1977.
2. "Multilayer-Multiconductor Microstrips for Digital Integrated Circuits," Patent No. 5,045,819; September 3, 1991.

OnLine Courses:

- I. EEE 443: Antennas for Wireless Communications**
(<http://balanis.faculty.asu.edu/EEE443>)
- II. EEE 543: Antenna Analysis and Design**
(<http://balanis.faculty.asu.edu/EEE543>)
- III. EEE 541: Electromagnetic Fields and Guided Waves**
(<http://balanis.faculty.asu.edu/EEE541>)
- IV. EEE 641: Advanced Electromagnetic Field Theory**
(<http://balanis.faculty.asu.edu/EEE641>)
- V. EEE 643: Advanced Topics in Electromagnetic Radiation**
(<http://balanis.faculty.asu.edu/EEE643>)

Short Courses:

I. "Antenna Theory, Design, and Measurements"

- 1. Naval Surface Weapons Center, Dahlgren, VA
- 2. Naval Air Warfare Center, Patuxent River, MD
- 3. Navy Depot, Cherry Point, NC
- 4. Arizona State University, Tempe, AZ
- 5. Lockheed of California, Burbank, CA
- 6. Rockwell International, Cedar Rapids, IA
- 7. U.S. Army, Fort Monmouth, NJ
- 8. GE Astro Space Division, Princeton, NJ
- 9. Federal Aviation Administration, Renton, WA
- 10. Boeing Company, Seattle, WA

II. "Advanced Antenna Theory and Design"

- 1. Naval Surface Weapons Center, Dahlgren, VA

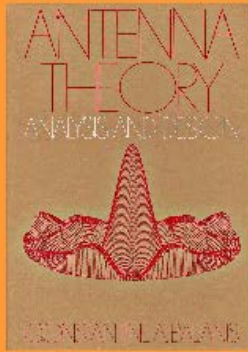
III. "Microwave Circuits and Design"

- 1. Naval Surface Weapons Center, White Oak Lab., Silver Springs, MD
- 2. Naval Surface Weapons Center, Dahlgren, VA
- 3. Naval Air Warfare Center, Patuxent River, MD

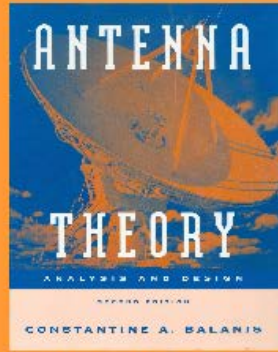
Publications:

I. Books (10)

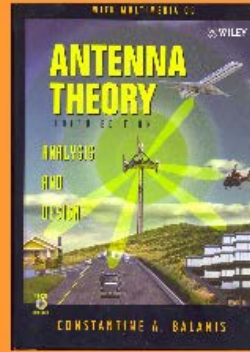
1. **Antenna Theory: Analysis and Design**, John Wiley & Sons, Inc.,
 - 2016 (4th Edition, pp. 1072)
 - 2005 (3rd Edition, pp. 1117)
 - 1997 (2nd Edition, pp. 950)
 - 1982 (1st Edition, pp. 816)
2. **Advanced Engineering Electromagnetics**, John Wiley & Sons, Inc.,
 - 2012 (2nd Edition, pp. 1018)
 - 1989 (1st Edition, pp. 981)
3. **Antenna Theory: Analysis and Design**, Translated in Chinese, 1st edition, Publishing House of Electronics Industry, Beijing, China, 1985, Vol. I, pp.409, Vol. II, pp. 446.
4. **Antenna Theory: Analysis and Design**, Translated in Korean, 2nd edition, Future khem Publishers, Korea, 2001, pp. 997.
5. **Antenna Theory: Analysis and Design**, Translated in Greek, 2nd edition, Ion Publishers, Athens, Greece, 2005, pp. 1013.
6. **Antenna Theory: Analysis and Design**, Translated in Portuguese, 3rd edition, LTC-Livros Technicos E. Cientificos Editora, S.A., Brazil, 2008.
7. **Antenna Theory: Analysis and Design**, Translated in Chinese, 3rd edition, Publishing House of Electronics Industry, China, 2008.
8. **Introduction to Smart Antennas** (P. Ioannides, coauthor), Morgan & Claypool Publishers, 2007.
9. **Introduction to Smart Antennas** (P. Ioannides, coauthor), Translated in Russian, TEXHOCFERA, Moscow, Russia 2012.
10. **Modern Antenna Handbook** (editor), John Wiley & Sons, Inc., 2008.



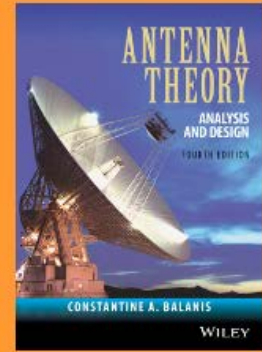
Antenna Theory: Analysis and Design (1st Edition)
 (John Wiley & Sons, 1982)
 Author:
 Constantine A. Balanis



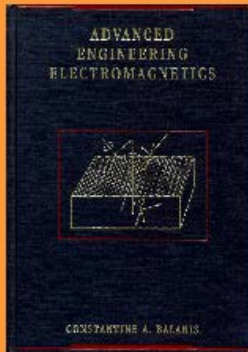
Antenna Theory: Analysis and Design (2nd Edition)
 (John Wiley & Sons, 1997)
 Author:
 Constantine A. Balanis



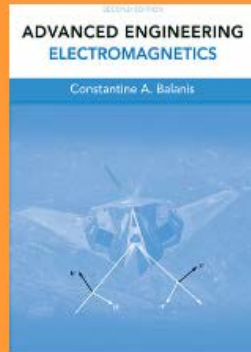
Antenna Theory: Analysis and Design (3rd Edition)
 (John Wiley & Sons, 2005)
 Author:
 Constantine A. Balanis



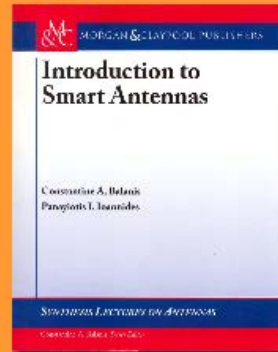
Antenna Theory: Analysis and Design (4th Edition)
 (John Wiley & Sons, 2016)
 Author:
 Constantine A. Balanis



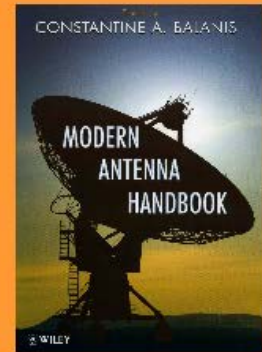
Advanced Engineering Electromagnetics (1st Edition)
 (John Wiley & Sons, 1989)
 Author:
 Constantine A. Balanis



Advanced Engineering Electromagnetics (2nd Edition)
 (John Wiley & Sons, 2012)
 Author:
 Constantine A. Balanis



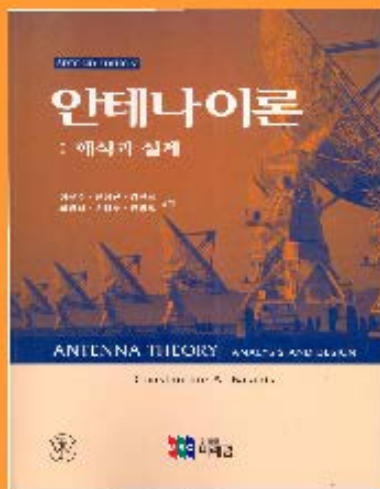
Introduction to Smart Antennas
 (Morgan & Claypool Publishers, 2007)
 Authors:
 Constantine A. Balanis
 Panayiotis I. Ioannidis



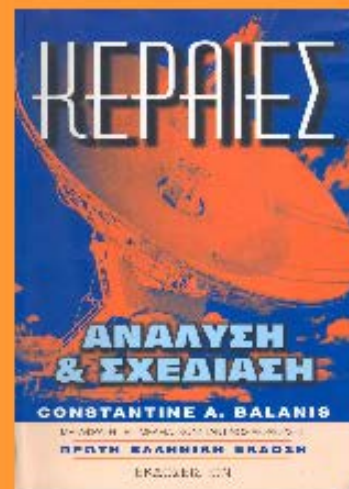
Modern Antenna Handbook
 (John Wiley & Sons, 2008)
 Editor:
 Constantine A. Balanis



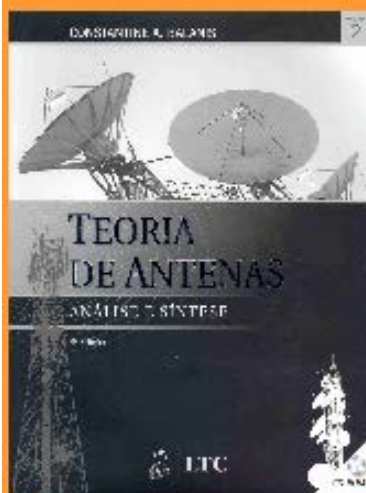
Antenna Theory: Analysis and Design
 (Chinese Translation
 1st Edition, 1985)
Publishing House of
 Electronics Industry
 Author:
 Constantine A. Balanis



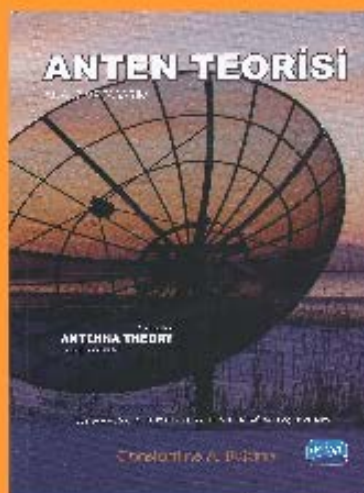
Antenna Theory: Analysis and Design
 (Korean Translation
 2nd Edition, 2001)
Future khem Publishers
 Author:
 Constantine A. Balanis



Antenna Theory: Analysis and Design
 (Greek Translation
 2nd Edition, 2005)
Ion Publishers
 Author:
 Constantine A. Balanis



Antenna Theory: Analysis and Design
 (Portuguese Translation
 3rd Edition, 2009)
LTC-Livros Técnicos e Científicos
 Editora S.A.
 Author:
 Constantine A. Balanis



Antenna Theory: Analysis and Design
 (Turkish Translation
 3rd Edition, 2013)
Nobel Akademik Yayıncılık
 Author:
 Constantine A. Balanis



Introduction to Smart Antennas
 (Russian Translation, 2012)
ТЕХНОСФЕРА, Moscow
 Authors:
 Constantine A. Balanis
 Panayiotis I. Ioannides

II. Book Chapters (10)

1. "Horn Antennas," Chapter 8 in **Antenna Handbook: Theory, Applications, and Design**, (Y. T. Lo & S. W. Lee, eds.), Van Nostrand Reinhold Co., Inc., 1988.
2. "Optimum Design of Horn Feeds for Reflector Antennas," **Electromagnetic Horn Antennas** (A. W. Love, ed.), IEEE Press, New York, 1976, pp. 184-185.
3. "Antenna", Microsoft, **Encarta Encyclopedia**, 1999,
(<http://encarta.msn.com/find/Concise.asp?z=1&pg=2&ti=00DC20C>).
4. S.-O. Park and C. A. Balanis, "Closed-Form Asymptotic Extraction Techniques in Method of Moments", pp. 124-130, in **Applied Computational Electromagnetics: State of the Art and Future Trends** (Eds: N. K. Uzunoglu, K. S. Ninita and D. I. Kaklamani), Springer, 2000.
5. J. Peng and C. A. Balanis, "Transparent Absorbing Boundary (TAB): In-Domain Computational Domain Truncation", pp. 223-230, in **Applied Computational Electromagnetics: State of the Art and Future Trends** (Eds: N. K. Uzunoglu, K. S. Ninita and D. I. Kaklamani), Springer, 2000.
6. C. A. Balanis, C. D. Katsibas and S. V. Georgakopoulos, "Wireless Mobile Antennas and Cosite Interference in Communication Systems", pp. 231-240, in **Applied Computational Electromagnetics: State of the Art and Future Trends** (Eds: N. K. Uzunoglu, K. S. Ninita and D. I. Kaklamani), Springer, 2000.
7. C. A. Balanis, A. C. Polycarpou, M. N. Vouvakis and C. R. Birtcher, "Hybridization of Boundary Element Method with the Finite Element Method in Electromagnetics," pp. 195-204, in **Boundary Elements XXIII**, (Eds. D. E. Beskos, C. A. Brebbia, J. T. Katsikadelis And G. D. Manolis), WIT Press, 2001.
8. Balanis, C. A. and A. C. Polycarpou, "Antennas", **Encyclopedia of Telecommunications**, John Wiley & Sons, NY, pp. 179-188, 2003.
9. Balanis, C. A., "Antenna Parameters", **Encyclopedia of RF and Microwave Engineering**, John Wiley & Sons, NY, Vol. 1, pp. 217-225, 2005.
10. Balanis, C. A., "Circular Waveguides", **Encyclopedia of RF and Microwave Engineering**, John Wiley & Sons, NY, Vol. 1, pp. 643-653, 2005.

III. Refereed Journal Papers (167)

1. **Balanis, C. A.** and Peters, L. Jr., "Analysis of aperture radiation from an axially slotted circular conducting cylinder using Geometrical Theory of Diffraction," *IEEE Trans. Antennas Propagat.*, Vol. AP-17, pp. 93-97, January 1969.
2. **Balanis, C. A.** and Peters, L. Jr., "Equatorial plane pattern of an axial-TEM slot on a finite size ground plane," *IEEE Trans. Antennas Propagat.*, Vol. AP-17, pp. 351-353, May 1969.
3. **Balanis, C. A.** and Peters, L. Jr., "Aperture radiation from an axially slotted elliptical conducting cylinder using Geometrical Theory of Diffraction," *IEEE Trans. Antennas Propagat.*, Vol. AP-17, pp. 507-513, July 1969.
4. **Balanis, C. A.**, "Radiation characteristics of current elements near a finite length cylinder," *IEEE Trans. Antennas Propagat.*, Vol. AP-18, pp. 352-359, May 1970.
5. **Balanis, C. A.** and Peters, Jr., L., "Radiation from TE₁₀-Mode slots on circular and elliptical cylinders," *IEEE Trans. Antennas Propagat.*, Vol. AP-18, pp. 400-403, May 1970.
6. **Balanis, C. A.**, "Pattern distortion due to edge diffractions," *IEEE Trans. Antennas Propagat.*, Vol AP-18, pp. 561-563, July 1970.
7. **Balanis, C. A.**, "Dielectric constant and loss tangent measurements at 60 and 90 GHz using the Fabry-Perot interferometer," *Microwave J.*, Vol. 14, No. 3, pp. 39-44, March 1971.
8. **Balanis, C. A.**, "Analysis of an array of line sources above a finite ground plane," *IEEE Trans. Antennas Propagat.*, Vol. AP-19, pp. 181-185, March 1971.
9. **Balanis, C. A.** and Cockrell, R. D., "Analysis and design of antennas for air traffic collision avoidance systems," *IEEE Trans. Aerosp. Electron. Syst.*, Vol. AES-7, pp. 960-967, September 1971.
10. **Balanis, C. A.**, "Radiation from conical surfaces used for high-speed spacecraft," *Radio Science*, Vol. 7, pp. 339-343, February 1972.
11. **Balanis, C. A.**, "Line sources above lossy media for low-frequency underground communication," *IEEE Trans. Antennas Propagat.*, Vol. AP-21, pp. 127-128, January 1973.
12. Truman, W. M. and **Balanis, C. A.**, "Optimum design of horn feeds for reflector antennas," *IEEE Trans. Antennas Propagat.*, Vol. AP-22, pp. 585-586, July 1974.

13. Holmes, J. J., **Balanis, C. A.** and Truman, W. M., "Application of Fourier Transforms for microwave radiometric inversions," *IEEE Trans. Antennas Propagat.*, Vol. AP-23, pp. 797-806, November 1975.
14. **Balanis, C. A.**, Rice, W. S. and Smith, N. S., "Microwave measurements of coal," *Radio Science*, Vol. 11, pp. 413-418, April 1976.
15. **Balanis, C. A.**, Walaska, R. C. and Franck, H. E., "Aircraft antenna system analysis," *Proc. IEE*, Vol. 123, pp. 281-284, April 1976.
16. **Balanis, C. A.** and Cheng, Y.-B., "Antenna radiation and modeling for microwave landing system," *IEEE Trans. Antennas Propagat.*, Vol. AP-24, pp. 490-497, July 1976.
17. Truman, W. M., **Balanis, C. A.** and Holmes, J. J., "Three-dimensional vector modeling and restoration of flat finite tank radiometric measurements," *IEEE Trans. Antennas Propagat.*, Vol. AP-25, pp. 95-104, January 1977 (Special Joint Issue of Radio Oceanography).
18. Truman, W. M., **Balanis, C. A.** and Holmes, J. J., "Three-dimensional vector modeling and restoration of flat finite wave tank radiometric measurements," *IEEE J. Oceanic Eng.*, Vol. OE-2, pp. 95-104, January 1977 (Special Joint Issue on Radio Oceanography).
19. Holmes, J. J. and **Balanis, C. A.**, "Electromagnetic modeling of reflections inside an In-Situ gasified coal seam," *Radio Science*, Vol. 12, pp. 33-39, January - February 1977.
20. Holmes, J. J. and **Balanis, C. A.**, "Refraction of a uniform plane wave incident on a plane boundary between two lossy media," *IEEE Trans. Antennas Propagat.*, Vol AP-26, pp. 738-741, September 1978.
21. Holmes, J. J. and **Balanis, C. A.**, "Electromagnetic modeling of transmissions through an In-Situ gasified coal seam," *IEEE Trans. Geosci. Electron.*, Vol. GE-16, pp. 308-313, October 1978.
22. **Balanis, C. A.**, Jeffrey, J. L. and Yoon, Y. K., "Electrical properties of eastern bituminous coal as a function of frequency, polarization, and direction of the electromagnetic wave, and temperature of the sample," *IEEE Trans. Geosci. Electron.*, Vol. GE-16, pp. 316-323, October 1978.
23. Radcliff, R. D. and **Balanis, C. A.**, "Reconstruction algorithms for geophysical applications in noisy environments," *Proc. IEEE* (special issue devoted to Applications of Electromagnetic Theory to Geophysical Exploration), Vol. 67, pp. 1060-1064, July 1979.
24. **Balanis, C. A.**, Shepard, P. W., Ting, F. T. C. and Kardosh, W. F., "Anisotropic electrical properties of coal," *IEEE Trans. Geosci. Remote Sensing*, Vol. GE-18, pp. 250-256, July 1980.

25. Radcliff, R. D. and **Balanis, C. A.**, "Electromagnetic geophysical imaging incorporating refraction and reflection," *IEEE Trans. Antennas Propagat.* (special issue on "Inverse Methods in Electromagnetics"), Vol. AP -29, No. 2, pp. 288-292, March 1981.
26. **Balanis, C. A.** and DeCarlo, D., "Monopole antenna pattern on finite size composite ground planes," *IEEE Trans. Antennas Propagat.*, Vol. AP-30, No. 4, pp. 764-768, July 1982.
27. Radcliff, R. D. and Balanis, C. A., "Modified propagation constants for nonuniform plane wave transmission through conducting media," *IEEE Trans. Geosci. Remote Sensing*, Vol. GE-20, No. 3, pp. 408-411, July 1982.
28. DeLauder, D. M. and **Balanis, C. A.**, "Microwave short-pulse generator for bed-level detection," *IEEE Trans. Instrum. Meas.*, Vol. IM-31, pp. 273-278, December 1982.
29. **Balanis, C. A.**, Radcliff, R. D. and Hill, Jr., H. W., "Radio-frequency imaging in geophysical applications," Invited Paper, *J. Microwave Power* (special issue on "Electromagnetic Techniques in Energy Applications"), pp. 83-93, March 1983.
30. **Balanis, C. A.**, "Electromagnetic techniques in the development of coal derived energy sources - A Review," Invited Paper, *J. Microwave Power* special issue on "Electromagnetic Techniques in Energy Applications"), pp. 45-54, March 1983.
31. **Balanis, C. A.**, Hartenstein, R. and DeCarlo, D., "Multipath interference for in-flight antenna measurements," *IEEE Trans. Antennas Propagat.*, Vol. AP-32, pp. 100-104, January 1984.
32. DeLauder, D. M. and **Balanis, C. A.**, "Numerical comparisons of short-pulse models for rough surfaces," *IEEE Trans. Geosci. Remote Sensing*, Vol. GE-32, pp. 585-591, November 1984.
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