2012

Ultra Low Profile Antenna for 2.45 GHz Wireless Communication

Rohadi, E., Taguchi, M., "Ultra low profile antenna for 2.45 GHz wireless communication", IEEE International Conference on Communication, Networks and Satellite (ComNetSat), Bali, pp. 103-107, 12-14 July 2012

Link to Publication

Abstract: The ultra low profile, conventional base fed F antenna is analyzed numerically and its characteristics are compared with those of the unbalanced fed, ultra low profile inverted L antenna. The design frequency is 2.45 GHz. When the size of conducting plane is 0.17 λ by 0.49 λ and the antenna height is 0.08 λ, the return loss bandwidth less than -10 dB becomes 15.92 % and the directivity is 3.94 dBi. In the numerical analysis, the electromagnetic simulator “WIPL-D” based on the method of moment is used.

On Equivalent Radius of Curvature for PWL Geometrical Modeling of a Loop Antenna

Lysko, A.A., "On Equivalent Radius of Curvature for PWL Geometrical Modeling of a Loop Antenna", IEEE Antennas and Wireless Propagation Letters, vol. 11, pp, 1323-1325, 2012

Link to Publication

Abstract: A circular loop antenna is often numerically modeled using a regular polygon. This approach is simple and robust, yet it alters the circumference of the loop and may thus shift the resonance frequency in the numerical model. This letter introduces a simple analytical formula for predicting and relating the accuracy of resonance frequency determination to the number of segments used. The result of testing on commercial software WIPL-D showed an excellent match between the prediction and numerically derived results. It is expected that the approach can be extended onto other structures with curvatures.

Electric Field Amplification inside a Porous Spherical Cavity Resonator Excited by an External Plane Wave

Bernhardt, P.A., Fernsler, R.F., "Electric Field Amplification inside a Porous Spherical Cavity Resonator Excited by an External Plane Wave", IEEE Transactions on Antennas and Propagation, vol. 60, no. 2, pp. 832-839, Feb. 2012

Link to Publication

Abstract: A spherical polyhedron constructed from open surface polygons is an electromagnetic wave resonator that can be excited by an external plane wave. The resonant frequencies of the porous sphere depend on the radius of the sphere and the area of the openings in the surface of the sphere. The strength of the internal electric fields varies with the width of the conducting edges that comprise the polyhedron frame. At the optimum edge width, the external EM wave field excites the strongest internal field amplitudes. The

WIPL-D EM simulation model is used to determine the optimum porous resonator for polyhedrons with 180 and 960 vertices. All of the cavity modes for a solid spherical cavity resonator can be excited in the porous spherical cavity resonator (PSCR). With a high resonator Q, an EM plane-wave of 1 V/m can excite an internal electric field of over 1000 V/m that takes finite time for fields to build up. The spherical cavity modes provide a variety of electric field distributions at the interior of the PSCR. The PSCR may be used to greatly increase the electric fields of a high power radio beam in order to produce isolated plasma clouds by neutral gas breakdown.

Dual Band Ultra Low Profile Inverted L Antenna

Taguchi, M., Sato, S., "Dual band ultra low profile inverted L antenna", International Symposium on Antennas and Propagation (ISAP), Nagoys, pp. 1417-1420, Oct. 29 2012-Nov. 2 2012

Link to Publication

Abstract: In this paper, a dual band, unbalanced fed inverted L antenna on a rectangular conducting plane is proposed and analyzed numerically. The parasitic elements are located near an unbalanced fed inverted L antenna. The design frequencies are 1.4 GHz and 2.2 GHz bands. In the numerical analysis, the electromagnetic simulator WIPL-D based on the method of moment is used.

2011

Comparison of Lightning-Induced Current Simulations in the Time and Frequency Domains Using Different Computer Codes

Aniserowicz, K., Maksimowicz, T., "Comparison of Lightning-Induced Current Simulations in the Time and Frequency Domains Using Different Computer Codes", IEEE Transactions on Electromagnetic Compatibility, vol. 53, no. 2, pp. 446-461, May 2011

Link to Publication

Abstract: A simulation of lightning-caused currents and fields with the use of seven commonly applied computer codes (NEC-2, NEC-4, AWAS-2, CDEGS, WIPL-D, MININEC, and FEKO) is presented. Near-field computations in a wide-frequency band from 100 Hz to 10 MHz with the assumption of perfectly conducting ground are performed. Similarities and discrepancies of computation results observed both in the time and frequency domains are described. The discrepancies originate from the application of different approximation techniques. Numerical problems are compared using an example of a loop located inside a lightning protection system directly hit by lightning. The paper is supplemented by a short description of the computer programs and two examples with analytical solution validating the numerical results.

Beam Steering for Circular Switched Parasitic Arrays Using a Combinational Approach

Mofolo, M.R.O., Lysko, A.A., Olwal, T.O., Clarke, W.A. , "Beam steering for circular switched parasitic arrays using a combinational approach", AFRICON, Livingstone, pp. 1-6, 13-15 Sept. 2011

Link to Publication

Abstract: In this paper we present a method of electronic beam steering for circular switched parasitic array (SPA) antennas. In circular SPA antennas, one achieves azimuth beam steering by open-circuiting and short-circuiting different parasitic elements, usually with only one parasitic element open-circuited at a time. For the SPA antenna with few parasitic elements, this results in low azimuth beam steering resolution. In the proposed method, we iterate through different combinations of parasitic elements and the possible switch states of the lumped impedance loads connected to the parasitic elements. Our method aims to increase the azimuth beam steering resolution of the circular SPA antennas. The method is verified using a combination of simulation (using both MATLAB and WIPL-D) and a SPA antenna prototype implementation. The MATLAB code uses the induced EMF method, while the WIPL-D uses the Methods of Moment (MoM) for solving the antenna impedances. The three sets of results (simulations and measurement) match very well at 2.4 GHz. The results indicate the availability of more options (different loading configurations) for electronic beam switching that can be adopted to improve the beam steering resolution of circular SPA antennas.

Miniaturization of Ultra Low Profile Inverted L Antenna on Rectangular Conductor

Taguchi, M., Kozaki, K., "Miniaturization of ultra low profile inverted L antenna on rectangular conductor", IEEE International Symposium on Antennas and Propagation (APSURSI), Spokane, WA, pp. 1197-1200, 3-8 July 2011

Link to Publication

Abstract: The ultra low profile inverted L antenna, whose horizontal element is bent as a meander line shape, is proposed and numerically analyzed for the reception antenna for the keyless entry system of automobiles at 315 MHz band. In the case of the conducting plane of 70 mm by 350 mm and the antenna height of 31.7 mm, the directivity of 2.48 dBi is obtained. In the numerical analysis, the electromagnetic simulator WIPL-D based on the Method of Moment is used.

Plasma Cloud Generation with Intense Electric Fields Inside a Porous Spherical Cavity Resonator Excited by an External Plane Wave

Bernhardt, P.A., Fernsler, R.F., Fliflet, A.W., "Plasma cloud generation with intense electric fields inside a porous spherical cavity resonator excited by an external plane wave", IEEE International Conference on Plasma Science (ICOPS), Chicago, IL, 26-30 June 2011

Link to Publication

Abstract: Summary form only given. A porous spherical cavity resonator (PSCR) may be used to greatly increase the electric fields of a high power radio beam in order to produce isolated plasma clouds by neutral gas breakdown. The PSCR is a spherical polyhedron constructed from open surface polygons. The high-Q wave resonator can be excited at specific resonant frequencies by an external plane wave incident on the sphere. The resonant frequencies of the porous sphere are determined by the radius of the sphere and by the area of the openings in the surface of the sphere. The strength of the internal electric fields is influenced by the width of the conducting edges that comprise the polyhedron frame. The surface of the sphere contains polygons with dimensions much smaller than a wavelength. The transmission through the surface of the sphere decreases with the open area of the polygons. The optimum edge width is found where the external EM wave field excites the strongest internal field amplitudes by both letting the excitation field inside the sphere and keeping the internal fields contained. The WIPL-D EM simulation model is used to determine the optimum porous resonator for polyhedrons with 960 vertices (V960). All of the cavity modes for a solid spherical cavity resonator can be excited in the porous spherical cavity resonator (PSCR). With a high resonator Q, an EM plane-wave of 1 V/m can excite an internal electric field of over 1000 V/m. The spherical cavity modes are simulated to provide a variety of electric field distributions at the interior of the PSCR. The theory predicts that a wide variety of plasma clouds may be generated inside the sphere using selected resonant modes. This technique will be tested at NRL using a powerful (6 kW) plasma source operating at 2.54 GHz to illuminate a V960 ball fabricated out of stainless steel using stereo lithography processes.

Resonant Properties of Conducting Polyhedral Spheres with Polygon Mesh Surfaces

Bernhardt, P.A., "Resonant properties of conducting polyhedral spheres with polygon mesh surfaces", XXX URSI General Assembly and Scientific Symposium, Istanbul, pp. 1-4, 13-20 Aug. 2011

Link to Publication

Abstract: A spherical polyhedron constructed from open surface polygons is an electromagnetic wave resonator that can be excited by an external plane wave. After an initial transient, a plane wave pulse achieves a balance of EM wave energy entering the sphere though the surface polygons and the internal EM wave leaking out of the sphere through the same polygons. The resonant frequencies of the porous sphere are primarily determined by the radius of the sphere and, to a lesser degree, by the size of the openings in the surface of the sphere. The strength of the internal electric fields is influenced by the width of the conducting edges that comprise the polyhedron frame. With thin edges, the internal resonance is too weak to produce large electric fields. With thick edges that nearly close the openings in the sphere, not much of the external electric field is available to excite the internal fields and again they are weak. The optimum edge width is found where the external EM wave field excites the strongest internal field amplitudes. The WIPL-D EM simulation model is used to determine the optimum porous resonator for a polyhedron with 180 vertices, 92 open polygon faces, and 270 conducting edges [1]. With a sphere radius of 5 meters, the resonance for the TM101 like mode occurs at a frequency of 25.228 MHz with edges having a radius of 225 mm. Excited with a right-hand-circular EM wave at 1 V/m, the internal resonant electric field is calculated to be 91.5 V/m. The Q of this resonator is 885 assuming infinitely conducting edges. With this high Q, an EM pulse takes about 100

micro seconds to build up a large electric field inside the sphere. Other spherical cavity modes were simulated to provide different distributions of electric fields on the interior of the porous spherical cavity resonator (PSCR). The PSCR may be used to greatly increase the electric fields in a high power radio beam for the purpose of plasma generation. For certain wavelengths, the porous sphe- - re becomes a resonator with large internal electric fields. At resonance, the radar cross section increases by over 40 dB. The radar wavelength is small relative to the size of the surface holes. The resonator theory is being tested at 2.45 GHz using an open-face, sphere with 960 vertices and tuned conducting edges. The large variations in RCS with frequency are studied with inside a compact range, anechoic chamber at the Naval Research Laboratory.

Design of Planar Crossed Monopole Antenna for Ultrawideband Communication

Ghosh, S., "Design of Planar Crossed Monopole Antenna for Ultrawideband Communication", IEEE Antennas and Wireless Propagation Letters, vol. 10, pp. 548-551, 2011

Link to Publication

Abstract: This letter proposes a planar crossed monopole antenna for ultrawideband application. The numerical simulations using Computer Simulation Technology (CST) transient solver and WIPL-D demonstrate that the impedance bandwidth of a rectangular monopole dramatically increases by including the cross plate. Parametric study on the crossed plate parameters is conducted to achieve the return loss of 10 dB over the desired frequency range (3.1-10.6 GHz). The stability of radiation pattern is also presented. The measured result for the return loss of a prototype antenna shows the same bandwidth as the simulated result.

2010

Analysis of Linear Biconical Antenna Array

Rao, C.S., Sudhakar, A., "Analysis of linear biconical antenna array", IEEE International Conference on Communication Control and Computing Technologies (ICCCCT), Ramanathapuram, pp. 12-16, 7-9 Oct. 2010

Link to Publication

Abstract: The biconical dipole antenna is frequency independent antenna. A dipole antenna is a narrowband and frequency dependent. In this paper a linear array of five biconical antennas with cone angle 30 is modeled in WIPL-D software and analyzed. Radiation pattern, gain, impedance and Sparameter plots of the array are analyzed and presented for 1-5 GHz frequency range. Mathematical equations for the parameters of the array are developed. Values for the parameters of the array are computed.

Radar Backscatter from Conducting Polyhedral Spheres

Bernhardt, P.A., "Radar Backscatter from Conducting Polyhedral Spheres", IEEE Antennas and Propagation Magazine, vol. 52, no. 5, pp. 52-70, Oct. 2010

Link to Publication

Abstract: Electromagnetic backscatter characteristics of conducting polyhedral spheres, constructed of 12 pentagons and a large number of hexagons, were investigated. The polyhedral structures were classified by their number of vertices and by the width of the conducting edges in their frames. Polyhedral spheres with 60, 80, 180, 240, 320, 500, 540, 960, and 1500 vertices were evaluated for their ability to scatter electromagnetic waves back to a source. The edge widths were varied between the limits of (1) nearly zero, to produce a wire-frame sphere; and (2) full surface closure of the polygon holes in the sphere, to form solid conducting structures. Using Method-of-Moments simulations with the WIPL-D code, the monostatic scattering properties of these spheres were studied over a wide range of structural and frequency parameters. The spherical wire frames had up to a 10 dB larger radar cross section than the completely solid spheres. This result provides models for new light-weight radar cross section targets used as satellite-calibration spheres with enhanced radar cross section for easier detection, low mass for easier launch, and low drag cross section for long orbit life. With selected edge widths, the monostatic radar cross section becomes vanishingly small at specific anti-backscatter frequencies, for conducting spherical shells with a regular pattern of polygon holes. These shells can be placed around solid spheres to nearly eliminate radar reflection from the composite object at specific frequencies. The polyhedral conducting-mesh (PCM) spheres with vanishing radar cross section at a desired frequency have applications for isotropic scattering sources that reflect no energy back to the electromagnetic source. the anti-backscatter polyhedral conducting-mesh spheres may provide insight for future stealth applications with spherical targets.

Antenna Modeling and Performance on Complex Structures and Airframes (EuCAP 2010)

Balanis, C.A., "Antenna modeling and performance on complex structures and airframes (EuCAP 2010)", Proceedings of the Fourth European Conference on Antennas and Propagation (EuCAP), Barcelona, Spain, pp. 1-5, 12-16 April 2010

Link to Publication

Abstract: In this paper the performance of basic elements, such as monopoles, apertures, and microstrip patches, when mounted on finite ground planes, ground-based vehicles and airborne platforms are modeled and simulated using high-frequency asymptotic methods [GTD/UTD] and full-wave methods [IE/MoM, FDTD and FEM]. While GTD/UTD shed more physical inside into the modeling, they generally are limited by the geometry of structures, constituent parameters, and small electrical size. On the other hand, full-wave simulators, such as IE/MoM, FDTD and FEM, (and commercial software such as WIPL-D, FEKO, HFSS and Xfdtd) are more versatile although usually they are limited by physical interpretation and large electrical size. The basic antenna radiation characteristic examined and simulated in this paper is the amplitude pattern formation and its distortion due to reflections, edge diffractions and rotor blade rotation. Typical amplitude patterns of radiators mounted on complex structures and airframes will be presented. In some cases simulated data is compared with measurements on scaled-models.

Reception Antenna Composed with Unbalanced Fed Inverted L Element for Digital Terrestrial Television in Japan

Taguchi, M., Shaojie Yang, "Reception antenna composed with unbalanced fed inverted L element for digital terrestrial television in Japan", International Conference on Communications, Circuits and Systems (ICCCAS), Chengdu, pp. 625-630, 28-30 July 2010

Link to Publication

Abstract: The array antenna is proposed for the reception antenna of the digital terrestrial television broadcasting in Japan. The ultra low profile unbalanced fed inverted L antenna on parallel conducting wires is used as the driven element and two wires are located at the forward and backward directions of driven element. In the case of antenna size of 320 mm by 83 mm by 148 mm, the return loss bandwidth larger than 10 dB is satisfied from 480 MHz to 650 MHz. The directivity becomes 6.0 dBi to 7.77 dBi at this frequency band. In the numerical analysis, the electromagnetic simulator WIPL-D based on the method of moment is used.

Improved Efficiency Measurement and Analysis Methods Using an Overmoded Wheeler Cap

Sutinjo, A., Johnston, R.H., Okoniewski, M., "Improved efficiency measurement and analysis methods using an overmoded wheeler cap", IEEE Antennas and Propagation Society International Symposium (APSURSI), Toronto, ON, pp. 1-4, 11-17 July 2010

Link to Publication

Abstract: The purpose of this paper is to extend the Improved Wheeler Cap measurement method to cases where the cavity is expected to overmode. Numerical processing methods will be applied to reduce the error introduced by overmoding cavity losses. The WIPL-D simulation tool is used to simulate the antenna in free space and in the Cap.

Band-Notched Modified Circular Ring Monopole Antenna for Ultrawideband Applications

Ghosh, S., "Band-Notched Modified Circular Ring Monopole Antenna for Ultrawideband Applications", IEEE Antennas and Wireless Propagation Letters, vol. 9, pp.276-279, 2010

Link to Publication

Abstract: This letter proposes a planar modified circular ring antenna for ultrawideband (UWB) applications with band notch performance. By suitably adjusting the antenna parameters, a return loss of 10 dB is achieved over the desired frequency range (3.110.6 GHz) except the notch frequency band. The band-notched characteristic is achieved by introducing a tuning stub inside the ring monopole. The results for return loss and radiation pattern are simulated using electromagnetic simulator WIPL-D. The time domain behavior of the

antenna in terms of the fidelity factor is evaluated using Computer Simulation Software (CST) transient solver. A prototype antenna is fabricated, and the simulated result for return loss is compared to the measured result.

Computational Electromagnetic Modeling & Simulation of Ultra Wideband Sub-Surface Sensors for the Detections and Imaging of Buried Objects Using Spatial and Spectral Diversity

Norgard, J., Musellman, R., Drozd, A., "Computational electromagnetic modeling & simulation of ultra wideband sub-surface sensors for the detection and imaging of buried objects using spatial and spectral diversity", Asia-Pacific Symposium on Electromagnetic Compatibility (APEMC), Beijing, pp. 544-547, 12-16 April 2010

Link to Publication

Abstract: An enhanced remote sensing technique for the detection and identification of deeply buried objects is presented in this paper. A new RF Tomographic Technique is proposed for developing RF CAT Scans of buried objects using spectral and spatial diversity. This imaging technique uses an embedded ring of subsurface radiators as the source of strong underground radiated transmissions. Distributed surface-contact sensors are used to collect the tomographic data for relay to a remote control site. Three-dimensional numerical imaging algorithms have been developed to detect, image, and characterize deeply buried objects. Distributed transmitters and receivers significantly increase unwanted mutual coupling and EM emissions that interfere with signal reception; however, by embedding the transmitters underground, reduced mutual coupling and EM emissions, and improved signal-to-noise ratios, can be achieved. Simple 2D surface SAR experiments over deep mine shafts were performed to validate and verify (V&V) the 3D processing algorithms using 2D surface SAR sensor data. The WIPL-D CEM Code was used to model and simulate (M&S) the embedded and distributed sensors and to verify the significant enhancement in the received signal-to-noise ratio obtained by burying the radiating antennas.

2009

Multipath Scattering by Cylinders and Spheres

Kononov, V.G., Balanis, C.A., "Multipath scattering by cylinders and spheres", IEEE Antennas and Propagation Society International Symposium (APSURSI), Charleston, SC, pp. 1-4, 1-5 June 2009

Link to Publication

Abstract: Scattering problems with multiple canonical scatterers, like cylinders and spheres, may be modeled by utilizing the orders-of-scattering approach. This method provides an exact solution; however, being iterative in nature, the accuracy of the solution depends on the number of iterations; in other words, the number of higher-order scattered fields taken into account. The orders-of-scattering solutions were compared against the numerical solutions, obtained using a commercial software such as WIPL-D, and an excellent

agreement is indicated. This technique has a potential for modeling dynamic multipath environments of multiple scatterers, such as those found in wireless communication environments, provided that the environment can be approximated by objects of canonical shape. The obtained results can then be compared with statistical models to shed more physical insight into the scattering process.

Modeling and Simulation of a Helicopter-Mounted Antenna Using WIPL-D

Reese, M.S., Balanis, C.A., Birtcher, C.R., Barber, G.C. , "Modeling and simulation of a helicopter-mounted antenna using WIPL-D", IEEE Antennas and Propagation Society International Symposium (APSURSI), Charleston, SC, pp. 1-4, 1-5 June 2009

Link to Publication

Abstract: The results obtained using WIPL-D for simulation of a seven element helicopter-mounted switched-beam antenna have been discussed. We have discussed the magnitude of the distortions caused in the antenna amplitude pattern for different rotor blade positions. We compared the results from these simulations to patterns when the main rotor and rotor hub are removed from the helicopter. This allows us to isolate the effects due to the blades and rotor from those of the rest of the helicopter airframe. As expected, the blades of the helicopter have a large impact on the pattern of the antenna. Fluctuations 10 dB in magnitude or more can be seen in the predicted patterns. Using a switching scheme that assigns a fixed coverage area to each patch element would not be the best choice because the gain performance will suffer when one of the elements experiences a drop in performance due to an obstacle. Based on the results shown, a more sophisticated switching method may be necessary since multipath degrades the performance of helicopter-mounted antennas. We have found that WIPL-D is a valuable tool throughout the process of modeling a helicopter-mounted antenna.

Adaptive Antenna Composed of Six Dipole Elements for Wireless LAN - Part 2 -

Taguchi, M., Yamashita, T., "Adaptive antenna composed of six dipole elements for wireless LAN - Part 2 -", IEEE Antennas and Propagation Society International Symposium, 2009. APSURSI'09, Charleston, SC, pp. 1-4, 1-5 June 2009

Link to Publication

Abstract: In this paper, the adaptive antenna composed of six printed dipole elements loaded with the chip capacitor at the feed point instead of the varactor diode is numerically and experimentally analyzed. The operating frequencies of wireless LAN are from 2.4 GHz to 2.4835 GHz. In the numerical analysis, the electromagnetic simulator "WIPL-D" based on the method of moment is used.

Efficiency Simulations on a Vivaldi Antenna in a Wheeler Cap

Johnston, R.H., "Efficiency simulations on a Vivaldi antenna in a Wheeler Cap", IEEE Antennas and Propagation Society International Symposium (APSURSI), Charleston, SC, pp. 1-4, 1-5 June 2009

Link to Publication

Abstract: The "Wheeler Cap" can be used to determine the radiation efficiency of electrically small antennas very accurately. The purpose of this paper is to simulate the improved Wheeler Cap measurement method with a Vivaldi antenna. The WIPL-D simulation tool is used to simulate the antenna in free space and in the Cap. This process can be used to test the accuracy of the improved Wheeler Cap method on an electrically large antenna.

Modeling and Analysis of an Efficient Bow-Tie Antenna for UWB Applications

Saidaiah, B., Sudhakar, A., Raju, K.P., "Modeling and Analysis of an Efficient Bow-Tie Antenna for UWB Applications", International Conference on Advances in Computing, Control, & Telecommunication Technologies (ACT), Trivandrum, Kerala, pp. 376-379, 28-29 Dec. 2009

Link to Publication

Abstract: UWB Communication Systems have recently attracted considerable research effort for their potential advantages of high data rate and low energy density. As one of the key components of an UWB system antennas with wide impedance bandwidth, stable gain and VSWR are required. Bow-Tie antenna is a good choice of UWB antennas. In this paper a Bow-Tie antenna is designed and modeled by using WIPL-D for a wide frequency range (3.1 to 10.6 GHz). The general characteristics of the antenna such as Gain, Impedance and VSWR are analyzed.

Design and Modeling of Biconical Dipole for Broad Band Applications

Rao, C.S., Sudhakar, A., "Design and Modeling of Biconical Dipole for Broad Band Applications", International Conference on Advances in Computing, Control, & Telecommunication Technologies (ACT), Trivandrum, Kerala, pp. 248-251, 28-29 Dec. 2009

Link to Publication

Abstract: A simple configuration that can be used to achieve broad band characteristics is the biconical antenna formed by two cones. In this paper the biconical dipole is modeled for examining its general characteristics. The biconical dipole with cone angle 90 degrees and its open wire structure equivalent are modeled by using WIPL-D program. The Gain and Radiation patterns are presented. The characteristics of the antenna such as VSWR, Impedance, S-Parameters over a wide frequency range (0.4 - 4 GHz) are analyzed.

2008

Three-dimensional Microwave Tomography: Waveform diversity and Distributed Sensors for Detecting and Imaging Buried Objects with Suppressed Electromagnetic Interference

Norgard, J., Musselman, R., Drozd, A. , "Three-dimensional Microwave Tomography: Waveform diversity and distributed sensors for detecting and imaging buried objects with suppressed electromagnetic interference", 1st Asia-Pacific Symposium on EMC (APEMC) and 19th International Zurich Symposium and Exhibition on Electromagnetic Compatibility, Singapore, pp. 371-374, 19-23 May 2008

Link to Publication

Abstract: Microwave tomographic techniques are described in this paper for developing high-resolution images of buried targets using 3D RF CAT Scans with frequency, angular, and polarization diversity and distributed sensors. Surface-contact sensors are used to collect the tomographic data for relay to a circling UAV and transmission to a remote control site (using layered sensing). 3D imaging algorithms have been developed to detect, image, and characterize buried targets. Distributed transmitters and receivers significantly increase unwanted mutual coupling and EM emissions (EMI) that interfere with signal reception, but also increase image resolution. For Ground Penetration (GPEN), reduced mutual coupling and EMI, and improved signal-to-noise ratios (SNR), can be achieved by embedding the transmitter/receiver sensors underground. Simple surface SAR experiments have been performed to detect deep mine shafts at the Zinc Corporation of America. 2D sensor data have been used to validate the 3D processing algorithms. Scale-model lab tests in the DETECT Chamber at AFRL have also been performed to optimize the tomographic images. In addition, WIPL-D models have been used to simulate the embedded and diverse/distributed sensors and to verify the significant enhancement in the received SNR for GPEN obtained by burying the radiating ring under the surface.

WIPL-D Software Validates Babinet's Principle

Lopez, A., "WIPL-D Software Validates Babinet's Principle", IEEE Antennas and Propagation Magazine, vol. 50, no. 3, pp. 138-139, Jun 2008

Link to Publication

Abstract: Antenna CAD software continues to increase in its capacity to solve electromagnetic problems. Recently, the WIPL-D software added a feature that permits the validation of the long-standing antenna design principle, Babinet's principle. This is truly unique, and is indicative of how advanced antenna computer software has become. This paper presents a WIPL-D validation of Babinet's principle.

Two Element Planar Dipole Array Antenna for Wireless LAN

Taguchi, M., Iwanaka, D., Yamashita, T. , "Two element planar dipole array antenna for wireless LAN", Proc. IEEE AP-S Int. Symp., San Diego, CA, pp. 1-4, 5-11 July 2008

Link to Publication

Abstract: In this paper, two element planar dipole array antenna fed by the parallel line has been proposed for 2.4 GHz band wireless LAN mesh network. In the numerical analysis, the electromagnetic simulator ldquoWIPL-Drdquo based on the method of moment is used. This antenna is numerically and experimentally analyzed. The current distributions of antenna elements are controlled by adjusting the lengths of dipole elements and the distance between them. The directivity of more than 6.69 dBi has been obtained from 2.4 GHz to 2.5 GHz.

Wideband Matching of a Small Disk-Loaded Monopole - Friedman's Antenna Revisited

Simpson, T.L., "Wideband matching of a small disk-loaded monopole - Friedman's antenna revisited", Proc. IEEE AP-S Int. Symp., San Diego, CA, pp. 1-4, 5-11 July 2008

Link to Publication

Abstract: This study has developed a two-layer printed circuit feed system that was analyzed with WIPL-D and has shown to achieve almost the same wideband character. As opposed to Friedman and Gouobau DLMs, the printed circuit feed system offers a low-cost alternative with similar performance.

2007

Numerical Analysis of Electromagnetic Field Distribution in Hollow Metallic Rectangular Parallelepiped with Roof

Taguchi, M., Abe, Y.S., Hamada, Y. , "Numerical Analysis of Electromagnetic Field Distribution in Hollow Metallic Rectangular Parallelepiped with Roof", Korea-Japan Microwave Conference (KJMW), pp. 29-32, 15-16 Nov. 2007

Link to Publication

Abstract: The hollow metallic rectangular parallelepiped with roof is excited by a dipole antenna located near it. The induced current distribution on the surface of parallelepiped and the neighboring electric field are numerically investigated by using the electromagnetic simulator WIPL-D based on the method of moment. The calculation frequency is 945 MHz.

Distributed/Embedded Sub-Surface Sensors for Imaging Buried Objects with Reduced Mutual Coupling and Suppressed Electromagnetic Emissions

Norgard, J., Wicks, M.C., Baldygo, W., Magde, K., Moore, W., Drozd, A., Musselman, R. , "Distributed/embedded sub-surface sensors for imaging buried objects with reduced mutual coupling and

suppressed electromagnetic emissions", International Waveform Diversity and Design Conference, Pisa, pp. 93-97, 4-8 June 2007

Link to Publication

Abstract: The proliferation of strategic subsurface targets has increased the need for remote sensing techniques providing for the accurate detection and identification of deeply buried objects. A new RF tomographic technique is proposed in this concept paper for developing RF CAT Scans of buried objects using spectral, spatial/angular, and polarization diversity. This tomographic imaging technique, developed by Wicks and presented in GPR 2004 [1], uses embedded subsurface radiators, delivered by earth-penetrating non-explosive, electronic "e-bombs", as the source of strong underground radiated transmissions. Distributed surface-contact sensors are used to collect the tomographic data for relay to a UAV and transmission to a remote site. Three-dimensional imaging algorithms have been developed to detect, image, and characterize deeply buried targets. By embedding the transmitters underground, reduced mutual coupling and EM emissions, and improved signal-to-noise ratios can be achieved. Simple surface SAR experiments over deep mine shafts have been performed to validate the 3D processing algorithms using 2D surface SAR sensor data. WIPL-D models have also been used to simulate the embedded and distributed sensors and to verify the significant enhancement in the received signal-to-noise ratio obtained by burying radiators under the surface.

Detection/Imaging of Buried Objects: Using Spatial/Angular Diversity with Distributed/Embedded Sub-Surface Sensors for Reduced Mutual Coupling and Suppressed EM Emissions

Norgard, J., Magde, K., Wicks, M., Drozd, A., Musselman, R. , "Detection/Imaging of Buried Objects: Using Spatial/Angular Diversity with Distributed/Embedded Sub-Surface Sensors for Reduced Mutual Coupling and Suppressed EM Emissions", IEEE International Symposium on Electromagnetic Compatibility, Honolulu, HI, pp. 1-5, 9-13 July 2007

Link to Publication

Abstract: The proliferation of strategic subsurface sanctuaries has increased the need for enhanced remote sensing techniques providing for the accurate detection and identification of deeply buried objects. A new RF Tomographic Technique is proposed in this concept paper for developing RF CAT Scans of buried objects using spectral, spatial/angular, and polarization diversity. This imaging technique uses an embedded ring of subsurface radiators, delivered by earth-penetrating, non-explosive, electronic "e-bombs", as the source of strong underground radiated transmissions and uses distributed surface-contact sensors to collect the tomographic data for relay to a circling UAV and transmission to a remote control site (using layered sensing). Three-dimensional imaging algorithms are being developed to detect, image, and characterize deeply buried targets. Distributed transmitters and receivers significantly increase unwanted mutual coupling and EM emissions that interfere with signal reception. However, by embedding the transmitters underground, reduced mutual coupling and EM emissions (and improved signal-to-noise ratios) can be achieved. Simple surface SAR experiments over deep mine shafts have been performed to validate the 3D processing

algorithms using 2D surface SAR sensor data. WIPL-D models have also been used to simulate the embedded and distributed sensors and to verify the significant enhancement in the received signal-to-noise ratio obtained by burying the radiating ring under the surface sensors.

2006

Solution of Large Complex Problems on 32-bit Desktop/Laptop Computers Using an Efficient and Accurate Out-Of-Core Solver

Yuan M., Taylor M. C., Sarkar T. K., "Solution of Large Complex Problems on 32-bit Desktop/Laptop Computers Using an Efficient and Accurate Out-of-Core Solver", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 460-465, (CD ROM Edition: s15p04.pdf), Miami, Florida, 12-16 March 2006.

Link to Publication

Abstract: -

Electromagnetic Interaction of Antennas Modeled by Infinitesimal Dipoles With Passive or Active Objects

Mikki S., Kishk A., "Electromagnetic Interaction of Antennas Modeled by Infinitesimal Dipoles With Passive or Active Objects", Proc. IEEE AP-S Int. Symp., pp. 791-794, (ISBN: 1-4244-123-2, CD ROM Edition: 0186.pdf), Albuquerque, USA, 9-14 July 2006.

Link to Publication

Abstract: In this paper, we study the performance of the obtained set of dipoles by comparing the fields radiated by them with the field obtained using a commercial full-wave solver. A calibration procedure was proposed to construct a realization of ideal dipoles within WIPL-D. Then, the interaction of the dielectric resonator antennas (DRA) with real environments is studied using the equivalent dipoles instead of the real antenna, assuming that the direct coupling between the antenna and the structure does not change significantly the antenna equivalent current distribution. Therefore, the equivalent set of dipoles is still a valid representation of the antenna in the presence of other structures. Here, the interaction effect of the equivalent set of dipoles is studied to show the validity of this concept and their limitations. Our intension is to create a library of several antennas that can be used with some commercial software to speed up computations and simplify the design of some applications. Such a library could be used with high frequency techniques. Then, without the need for hybrid techniques the interactions of complicated objects with complicated antennas can easily be studied. However, most of the commercial software packages have no implementation of the infinitesimal dipoles as a possible excitation source. Therefore, we try to find a more practical numerical model for the infinitesimal dipole that can be modeled with certain wires implemented in these software packages. In the near future, this model will be used in microwave imaging of the breast cancer detection when frequency domain techniques are used

Antenna Modeling by Frequency Dependent Hertzian Dipoles Using Particle Swarm Optimization

Wu X. H, Kishk A. A., Glisson A. W., "Antenna Modeling by Frequency Dependent Hertzian Dipoles Using Particle Swarm Optimization", Proc. IEEE AP-S Int. Symp., pp. 3527-3530, (ISBN: 1-4244-123-2, CD ROM Edition: 0828.pdf), Albuquerque, USA, 9-14 July 2006.

Link to Publication

Abstract: -

Solving Lumped Loading Problem in Time Domain Using EFIE and Laguerre Polynomials as Temporal Basis Functions

Ji Z., Sarkar T. K., Hebron T., Ghosh D., "Solving Lumped Loading Problem in Time Domain Using EFIE and Laguerre Polynomials as Temporal Basis Functions", Proc. IEEE AP-S Int. Symp., pp. 527, (ISBN: 1-4244-123-2, CD ROM Edition: 1475.pdf), Albuquerque, USA, 9-14 July 2006.

Link to Publication

Abstract: -

Infinitesimal Dipole Model for Dielectric Resonator Antennas Using the QPSO Algorithm

Mikki S., Kishk A. A., "Infinitesimal Dipole Model for Dielectric Resonator Antennas Using the QPSO Algorithm", Proc. IEEE AP-S Int. Symp., pp. 3285-3287, (ISBN: 1-4244-123-2, CD ROM Edition: 0772.pdf), Albuquerque, USA, 9-14 July 2006.

Link to Publication

Abstract: The problem of finding a set of infinitesimal dipoles to represent an arbitrary antenna with known near field distribution was considered. By formulating this task as an optimization problem using the directional cosines, the recently introduced quantum particle swarm optimization (QPSO) algorithm was able to successfully obtain good solution. A new boundary condition was introduced to handle the coupling between the directional cosines. The frequency response of the dipole model was also investigated. Although the model was obtained at a single design frequency, the dipoles at the same locations can be used through a wideband scheme by correcting the dipole moments. The correction factor required has been shown to be related to the input impedance of the DRA. A simple procedure is suggested to estimate the correction factor over the frequency band of interest

Error in Projection of Plane Waves Using the RWG Basis Functions

Yang M., Song J. M., "Error in Projection of Plane Waves Using the RWG Basis Functions", Proc. IEEE AP-S Int. Symp., pp. 2874-2876, (ISBN: 1-4244-123-2, CD ROM Edition: 0674.pdf), Albuquerque, USA, 9-14 July 2006.

Link to Publication

Abstract: The error in projection of the induced current of a plane wave using the Rao-Wilton-Glisson (RWG) basis functions has been studied numerically. The vector current in a finite area is expanded by full and half RWG basis functions, and the unknown projection coefficients are solved by the Galerkin's method. The error is calculated for different polarizations, different meshes and mesh densities, and different incident angles. It is found that the error in the projection of curl-free vectors is less than that of divergence-free vectors, and the RWG basis has the projection error in range of 10 to 20 percents for the mesh with 10 unknowns per wavelength

Improving Conditioning of the Surface Integral Equation Formulations Using Normalize ...

Ylä-Oijala P., Taskinen M., "Improving Conditioning of the Surface Integral Equation Formulations Using Normalized Fields and Currents", Proc. IEEE AP-S Int. Symp., pp. 2913-2916, (ISBN: 1-4244-123-2, CD ROM Edition: 0684.pdf), Albuquerque, USA, 9-14 July 2006.

Link to Publication

Abstract: Surface integral equation (SIE) method is one of the most popular numerical methods in the electromagnetic analysis of metallic and dielectric objects. Unfortunately, in many cases discretization of a SIE leads to a matrix equation with a high condition number, which may cause problems in numerical solution. In the case of dielectric and composite metallic and dielectric objects, the poor conditioning of the SIE matrix is due to the difference in scales among the unknowns, the electric and magnetic surface current densities, and the matrix elements. This paper presents an efficient method to improve the balance between the unknowns and the matrix elements. The method is based on the use of normalized field quantities and unknowns, and carefully chosen scaling factors. Numerical results show that a significant reduction in the condition number of the matrix can be obtained with the new normalized and scaled SIE formulations

Analysis of Wires inside a Reverberation Chamber Using the Method of Moments Combined with Spectral Domain Techniques and Asymptotic Extraction

Karlsson K., Carlsson J., Kildal P-S., "Analysis of Wires inside a Reverberation Chamber Using the Method of Moments Combined with Spectral Domain Techniques and Asymptotic Extraction", Proc. EuCAP Int. European Conf., (ISBN: 92-9092-937-5, CD ROM Edition: 361998kk.pdf), Nice, France, 6 - 10 Nov. 2006.

Link to Publication

Abstract: In this paper we will present a method of moments (MoM) code that can be used for analyzing PEC objects in a reverberation chamber (RC). The RC is treated as a rectangular cavity, and the Green's function of

it is constructed by using planar wave spectral domain techniques and imaging combined with periodic boundary conditions. Several validation cases based on comparisons with other computer codes are also presented.

A General Treatment for the Electromagnetic Modeling of Composite Structures with the Method of Moments

Craeye C., Piette M., Gilles T., "A General Treatment for the Electromagnetic Modeling of Composite Structures with the Method of Moments", Proc. EuCAP Int. European Conf., (ISBN: 92-9092-937-5, CD ROM Edition: 349404.pdf), Nice, France, 6 - 10 Nov. 2006.

Link to Publication

Abstract: For more than twenty years, especially since the advent of the well known and extensively used Rao-Wilton-Glisson (RWG) subdomain functions, a lot of accurate electromagnetic modelling with the Method of Moments (MoM) has been accomplished, firstly and mainly for Perfect Electric Conductors (PEC), later also for dielectric bodies. Composite structures made of adjacent homogeneous PEC and dielectric bodies has received much fewer attention so far [2]. To date, though quite general approaches have been presented [3], no full treatment of this problem has been given yet. The purpose of this paper to make new steps towards such a full treatment. First of all, the PEC bodies are presented along with their dual counterpart, the PMC bodies. Next, both volumic bodies and plates are combined in every possible ways. The concepts of singular edges and branched bodies are introduced, and the importance of electrical continuity is emphasized. The essential notion of RWG sectors is identified, for which two important properties are demonstrated. The treatment of composite structures is made very general to allow the use the any testing scheme, coupled to any redundancy reduction scheme. Finally, a new general approach based on the sector property table is proposed where perfect conductors appear as a special case of dielectrics.

WIPL-D Model and Simulation Results for a 6ft Diameter Impulse Radiating Antenna (IRA)

Taylor M. C., Sarkar T. K., "WIPL-D Model and Simulation Results for a 6ft Diameter Impulse Radiating Antenna (IRA)", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 483-486, Miami, Florida, 12-16 March 2006

Link to Publication

Abstract: WIPL-D was used to model and simulate an Impulse Radiating Antenna (IRA) with a 6ft diameter paraboloidal reflector and 45 degree feed arms. Model views are shown and the results of frequency domain simulation up to 2GHz are plotted for the two cases of the IRA as transmitter and as receiver. The simulated frequency domain data is inverse Fourier transformed to obtain the time domain response to a Gaussian pulse input. This far-field transient response is integrated to obtain the response to a step input, which compares well with the theorized step input response of the IRA.

Modeling and Testing a Prototype HF Towel-Bar Antenna on a Coast Guard Patrol Boat – 110-Ft Working Patrol Boat (WPB)

Beckmann R. C., Clemons B. R., Dr. McKaughan M. E., "Modeling and Testing a Prototype HF Towel-Bar Antenna on a Coast Guard Patrol Boat - 110-Ft Working Patrol Boat (WPB)", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 54-58, Miami, Florida, 12-16 March 2006

Link to Publication

Abstract: An undergraduate capstone project is described where students have designed a Near-Vertical Incidence Skywave (NVIS) for a Coast Guard 110-foot working patrol boat (WPB). This paper presents follow-on work to that reported at the 2005 ACES conference. The emphasis of this part of the project is the installation and testing of a prototype antenna on a patrol boat. Test results of preliminary antenna measurements are discussed. The projection of the actual installation process and testing are also included.

Blue Force Tracker Antenna Placement Study on a CH-53E Helicopter

Vu D. H., Decarlo D., "Blue Force Tracker Antenna Placement Study on a CH-53E Helicopter", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 453-455, Miami, Florida, 12-16 March 2006

Link to Publication

Abstract: The motivation of this study is to define the best placement for the Blue Force Tracker (BFT) satellite communications (SATCOM) antenna on a CH-53E heavy lift helicopter. When an antenna is chosen for a specific application, careful analysis of its placement must first be conducted to ensure desired performance. Platform mounted performance often deviates significantly from free space performance. The analysis was performed purely through a Computational Electromagnetics (CEM) modeling and analysis approach, rather than traditional field measurements. This resulted in lower cost and higher flexibility. The BFT antenna was built and refined in WIPL-D, a Method-of-Moments (MoM) antenna analysis software. Free space performance was determined and compared to field measurements. The CH-53E model was taken from a CATIA, a Computer Aided Design (CAD) software, imported into GID, a CAD and meshing commercial software. It was then refined and meshed at the operating frequency and was imported into WIPL-D via an internally prepared MATLAB script. Three locations were examined in detail. Other locations were considered but quickly dismissed due to mechanical, presence of pre-existing antennas, or high blockage problems. The location with the best performance was the one where the antenna was placed at fuselage station (FS) 660.5, and buttock line (BL) 16L.

Design and Modeling of a VHF Bow-Tie Cross-Dipole Antenna Onboard a Generic Fuselage

Saakian A. S., Tabet S. N., "Design and Modeling of a VHF Bow-Tie Cross-Dipole Antenna Onboard a Generic Fuselage", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 447-449, Miami, Florida, 12-16 March 2006

Link to Publication

Abstract: A Bow-Tie Cross-Dipole (BT-CD) design is considered as a potentially broadband horizontally polarized (H-Pol) antenna. Even though it is possible to use the BT-CD in both the VHF and UHF bands, the analysis in this effort is solely focused on the 174-230 MHz frequency range in the VHF-band. The BT-CD antenna is designed and optimized in the presence of a generic fuselage using WIPL-D, a Method of Moments (MoM) program. The design and optimization are carried out to obtain 1.6:1 VSWR (i.e., = -12.74 dB return loss) or better, and -5 dBi matched gain or better. A lumped two-element, parallel LC circuit in parallel with the antenna feed, matching circuit is used to compensate for the imaginary component of the input admittance, to obtain acceptable VSWR.

Analyses of VHF/UHF and GPS Antennas Onboard an Unmanned Aerial Vehicle Helicopter

Tabet S. N., "Analyses of VHF/UHF and GPS Antennas Onboard an Unmanned Aerial Vehicle Helicopter", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 487-492, Miami, Florida, 12-16 March 2006

Link to Publication

Abstract: Major advances in technology have put the use of unmanned aerial vehicles (UAVs) at the forefront in commercial and military applications. Such UAVs are being used for weather, reconnaissance, aerial mappings, and military operations. UAVs come in different sizes, shapes, and forms. The two most common types of UAVs are fixed wing and rotary. In this effort, the latter is referred to as a UAV helicopter (UAVH). At the heart of a UAV mission's success are the antennas onboard. These antennas are used to perform many tasks such as: Manual takeoff, flight, or landing a UAV; relay of messages or data; and other mission specific tasks. This effort concentrates on the modeling and analysis of three VHF/UHF antennas and two GPS antennas onboard a UAVH. Two of the three VHF/UHF antennas are 14-inch blades, and the third is a 9-inch blade, each operating in the 30-400 MHz frequency range. The GPS antennas are dual-stacked circular patches, operating at 1575.42 MHz (L1) and 1227.6 MHz (L2) frequencies. However, only the analysis at L1 is provided in this effort. The majority of the UAVH model preparation is performed in GiD, a commercial CAD and meshing software. The computational electromagnetics (CEM) modeling and analysis effort is carried out using WIPL-D, a Method of Moments (MoM) software.

Two Element Phased Array Dipole Antenna

Taguchi M., Era K., Tanaka K., "Two Element Phased Array Dipole Antenna", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 466-469, Miami, Florida, 12-16 March 2006

Link to Publication

Abstract: Two element array dipole antenna with 90° phase difference feed is proposed for the directional antenna. In the numerical analysis, the electromagnetic simulator WIPL-D based on the Method of Moment is used. The distance between two elements is fixed to be a quarter wavelength at the design frequency 2.45 GHz. By adjusting the length of two elements, the front-to-back ratio of 13.6 dB is obtained. The relation between the front-to-back ratio of this antenna and the feed point currents of dipole elements is discussed. The measured input impedance with 90 degree hybrid agrees with the calculated result.

A Two Dimensional Slot Array Antenna

Johnston R. H., Rao Q., "A Two Dimensional Slot Array Antenna", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 476-482, Miami, Florida, 12-16 March 2006

Link to Publication

Abstract: The concept of a linear long slot antenna of novel structure is extended to two dimensions. Half wave slots are interconnected with a phase reversing section consisting of cross slots and cross over connections. These sections ensure that adjacent half wave sections of the slot radiator produce in-phase radiation. A two dimensional structure should have even better gain then a linear structure. The planar structure uses a reflecting plane to provide one main forward lobe and a high gain.

Particle Swarm Optimization Applied to EM Problems

Olćan D. I., Golubović R. M., "Particle Swarm Optimization Applied to EM Problems", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 442-446, Miami, Florida, 12-16 March 2006

Link to Publication

Abstract: This paper summarizes results for preferred values of the Particle Swarm Optimizer (PSO) parameters when it is applied to EM problems. The PSO is applied to two different EM optimization problems. The first problem is the optimization of the position of a rectangular waveguide feed, which has two optimization variables. The second problem is the optimization of the excitations of a broadside antenna array, which has twenty optimization variables. The results show that the preferred parameters of PSO are somewhat different for optimization problems with different number of dimensions of the optimization space.

Simulating EM Scattering from Forests by WIPL-D Code

Olcan D. I., Kolundzija B. M., Janic B.B., "Simulating EM Scattering from Forests by WIPL-D Code", Proc. IEEE AP-S Int. Symp., pp. 148, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: -

Modeling, Simulation and Transient Analysis of a Bistatic Impulse Radiating Antenna (IRA Scene)

Taylor M. C., Sarkar T. K., "Modeling, Simulation and Transient Analysis of a Bistatic Impulse Radiating Antenna (IRA) Scene", Proc. IEEE AP-S Int. Symp., pp. 95, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: -

Short Pulse Characteristics of New Wide Band Planar Dipoles – Both Transmission and Reception

De A., Ghosh D., Sarkar T.K., "Short pulse characteristics of new wide band planar dipoles – both transmission and reception", Proc. IEEE AP-S Int. Symp., pp. 167, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: -

Design of Dielectric Resonator Sensor with Minimized Ground Plane Size for Microwave Breast Cancer Detection

Huang W., Kishk A. A., "Design of Dielectric Resonator Sensor with Minimized Ground Plane Size for Microwave Breast Cancer Detection", Proc. IEEE AP-S Int. Symp., pp. 1115-1118, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: In this paper, a wideband dielectric resonator antenna (DRA) sensor with small ground plane is designed for microwave breast cancer detection. A coaxial probe excites a two-steps stair shaped DRA. To reduce the backward leakage with the small ground plane size a quarter wavelength choke is added to the back of the ground plane. The impedance bandwidth of 46% is achieved. The effect of attaching the sensor to the breast tissue is investigated when the sensor is directly attached to the breast tissue

Fast Numerical Model of Reverberation Chambers with Metal Stirrers Using Moment Method and Cavity Green's Function Calculated by Ewald Summation

Carlberg U., Kildal P-S., Kishk A. A., "Fast Numerical Model of Reverberation Chambers with Metal Stirrers Using Moment Method and Cavity Green's Function Calculated by Ewald summation", Proc. IEEE AP-S Int. Symp., pp. 2827-2830, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: Reverberation chambers (RC) are metal cavities used for measuring electronic devices. When designing RCs it might be useful to have a numerical model of them. Since a RC is large in terms of wavelength this is challenging. A numerical model of a rectangular metal cavity is developed using method of moments (MoM) and a cavity Green's function (GF). In this way, unknowns at the walls or in the volume of the cavity are not needed. Since movable parts have to be modeled, extensive computations are needed to cover all possible positions of these parts, and statistical analysis has to be used. Therefore, computational speed is very important. In the present paper, various methods used to reduce the computation time of the code and how it is implemented for perfect electric conducting thin wires and plates located inside the chamber are described

Antenna Optimization for RF Mote Communications

Johnston R.H., Finvers I.G., Haslett J.W., "Antenna Optimization for RF Mote Communications", Proc. IEEE AP-S Int. Symp., pp. 2133-2136, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: Compact RF transceivers with integrated sensors (called "motes") are used in wireless sensor networks to monitor such things as patient vital signs, environmental parameters and manufacturing processes. One of the limiting factors for mote size and efficiency is the antenna. This paper examines, in both the transmitting and receiving modes, the impedance matching for the antenna used on a commercially available mote and shows that significant improvements in efficiency can be made through improved antenna impedance matching

A Novel Symmetrical Coupled-Line Bandpass Filter Structure with Improved Stop-Band Performance

De A., Yuan M., Sarkar T. K., "A Novel Symmetrical Coupled-Line Bandpass Filter Structure with Improved Stop-Band Performance", Proc. IEEE AP-S Int. Symp., pp. 163, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: -

Analysis of Dead Zone of RFID System

Mitsuo Taguchi M., Mizuno H., "Analysis of Dead Zone of RFID System ", Proc. IEEE AP-S Int. Symp., pp.4759-4762, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: The dead zone of RFID system has been numerically and experimentally investigated. The electric field distribution near the square conducting plate was numerically obtained when the plane wave is incident. The current distribution on the conducting plate in the case of spherical wave incidence is expressed by the integration of induced current due to the plane wave incidence. The scattered electric field was calculated and discussed. The electric field distribution near the conducting plate was measured and the existence of the dead zone was shown

Feed Arrangements for 2D Slot Array Antennas

Johnston R. H., Rao Q., "Feed Arrangements for 2D Slot Array Antennas", Proc. IEEE AP-S Int. Symp., pp. 3420-3423, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: A recently presented linear long slot array antenna is extended to a 2D slot array structure. A number of two dimensional slot array antennas are numerically simulated with various feed arrangements and the performances are assessed. The antennas are intended to handle both linear polarizations

Radiation Properties of Tapered Slot Antenna Constructed with Wire Grid Mesh

Matsui A., Okubo T., Fukase Y., "Radiation Properties of Tapered Slot Antenna Constructed with Wire Grid Mesh", Proc. IEEE AP-S Int. Symp., pp. 2579-2582, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: This paper presents a tapered slot antenna (TSA) constructed with wire grid mesh and describes its basic radiation characteristic. Conventional TSA is fabricated by copper foil on dielectric substrate. It is used in various applications over high microwave range since it radiates unidirectional endfire and performs wide band matching characteristics. And many researchers study the design method of TSA to enhance its radiation properties. To realize the antenna and its performance in low frequency such as VHF or UHF band, however, is difficult because the plane structure is bulky. A meshed tapered slot antenna (MTSA), which is composed of wire grid mesh, is proposed in order to overcome the disadvantage

Comparative Study on Different Feeding Techniques for Dual Polarized Dielectric Resonator Antennas

Chair R., Kishk A. A., Lee K. F., "Comparative Study on Different Feeding Techniques for Dual Polarized Dielectric Resonator Antennas", Proc. IEEE AP-S Int. Symp., pp. 2495-2498, Albuquerque, USA, 9-14 July 2006.

Link to Publication

Abstract: Here, we design and analyze several dual polarized dielectric resonator antennas (DRA) excitation techniques and compare their advantages and disadvantages. A simple cylindrical disk DRA is used. It is

designed to resonate around 10 GHz. The feeding mechanisms include probe excitation, aperture couple excitation and co-planar waveguide (CPW) feed. In addition, we also discuss combinations of different feeding mechanisms, such as probe/aperture or aperture/CPW. The comparisons are based on resonant frequency, common matching bandwidth (S11 < -10 dB), isolation and radiation pattern symmetry

Millimeter Wave Printed Antenna Array with High Side Lobe Suppression

Nesic A., Micic Z., Jovanovic S, Radnovic I., "Millimeter Wave Printed Antenna Array with High Side Lobe Suppression", Proc. IEEE AP-S Int. Symp., pp. 3051-3054, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: In this paper we introduce new millimeter wave antenna array with relatively high gain of 20.8 dBi and high side lobe suppression. The antenna consists of axial array placed between corner reflector plates. The antenna is designed and realized in the frequency range about 26 GHz which is popular for microwave communication networks. Side lobe suppression in both H- and E-plane is better than 32 dB. The bandwidth of the antenna is wider than 15% and losses are about 1 dB. The antenna is suitable for integration with other microwave circuits. Agreement between simulated and measured results is very good. The presented antenna is low cost and very simple for realization

EBG Superstrate for Gain Enhancement of a Circularly Polarized Patch Antenna

Iriarte, J.C., Ederra, I., Gonzalo, R., Gosh, A., Laurin, J.J., Caloz, C., Brand, Gavrilovic.M, Demers, Y., de Maagt, P., "EBG Superstrate for Gain Enhancement of a Circularly Polarized Patch Antenna", Proc. IEEE AP-S Int. Symp., pp. 2993-2996, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: EBG enhanced antennas could advantageously replace conventional array antenna in Geo-synchronous global Earth coverage applications at S-band and lower frequencies. This new technology simplifies the antenna configuration and can potentially lead to lighter and cost effective solutions, by either eliminating or strongly simplifying the antenna beam forming network (BFN). Excellent agreement between the predictions and the measurements has been shown

Evolutionary Design of a Phased Array Antenna Element

Globus A., Linden D., Lohn J., "Evolutionary Design of a Phased Array Antenna Element", Proc. IEEE AP-S Int. Symp., pp. 2071-2073, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: This paper presents an evolved S-band phased array antenna element design that meets the requirements of NASA's TDRS-C communications satellite scheduled for launch early next decade. The original specification called for two types of elements, one for receive only and one for transmit/receive. A single element design was evolved that meets both specifications thereby simplifying the antenna and reducing testing and integration costs. The highest performance antenna found using a genetic algorithm and stochastic hill-climbing has been fabricated and tested. Laboratory results are largely consistent with simulation

Integrated Phased Antenna Array Design Using Ferroelectric Materials and the Coplanar Waveguide Continuous Transverse Stub Technologies

Kim W., Iskander M. F., "Integrated Phased Antenna Array Design Using Ferroelectric Materials and the Coplanar Waveguide Continuous Transverse Stub Technologies", Proc. IEEE AP-S Int. Symp., pp. 4323-4326, Albuquerque, USA, 9-14 July 2006

Link to Publication

Abstract: In this paper, a new integrated phased array antenna system employing the ferroelectric materials technology for electronic beam steering capabilities is described. The design integrates a ferroelectric coplanar waveguide phase shifter with the continuous transverse stub (CTS) array. The phase shifter employs a multi-dielectric substrate and includes a thin layer of silicon dioxide between the signal conductors and the ferroelectric material to reduce the insertion losses and produce good impedance matching. The coplanar waveguide-based multi-dielectric layer design demonstrated an effective ferroelectric biasing architecture and exhibited an increase in figure of merit by up to 8deg/dB from that of the direct metallization approach. An integrated two elements phased array antenna is developed and demonstrates linearly polarized radiation with +/-20deg of beam scanning between the unbiased and biased states of the ferroelectric phase shifter

Benchmark of Lens Antennas for KA-Band Global Earth Observation from Leo Satellites

Costa J. R., Fernandes C. A., Godi G., Sauleau R., Legay H., "Benchmark of Lens Antennas for KA-Band Global Earth Observation from Leo Satellites", Proc. EuCAP Int. European Conf., Nice, France, 6 - 10 Nov. 2006

Link to Publication

Abstract: This paper compares two different compact lens antenna approaches for a global Earth observation application at 26 GHz. Lens specifications were defined by Alcatel Alenia Space within the framework of ACE Network of Excellence activities. The lenses are required to match a secant square type radiation pattern template in the elevation plane. Two alternative specifications are defined for the azimuth radiation pattern template: either omnidirectional or with a mechanically scanned sector beam to enhance gain. Two alternative lens approaches are also evaluated for the above cases: one based on an axial-symmetric dome lens geometry (developed at "Instituto de Telecomunicacoes", Portugal) and another one based on a fully 3D lens design (developed at "IETR", France).

Small Semi Directional Antenna for UWB Terminal Applications

D'Errico R., Ghannoum H., Roblin C., Sibille A., "Small Semi Directional Antenna for UWB Terminal Applications", Proc. EuCAP Int. European Conf., Nice, France, 6 - 10 Nov. 2006

Link to Publication

Abstract: The design of an ultra wide band (UWB) semi-directional antenna is presented. Both antenna optimizations by simulation and measurement results are presented. The final prototype size is 33 mm times 20 mm times 11.5 mm. The achieved input bandwidth is 3.9-15 GHz. The maximum boreside realized gain (BRG) is 7.5 dBi and the maximum Front-to-Back-ratio (FTBR) is 13 dB. The frequency variance of the antenna gain is exploited in a two-antenna radio link in order to compensate that of free space attenuation.

High Power, Dual Polarized Antenna Feed Technology for Mobile Applications

Dupessey V., Markland P., Uher J., McDougall J. , Richard D., "High Power, Dual Polarized Antenna Feed Technology for Mobile Applications", Proc. EuCAP Int. European Conf., Nice, France, 6 - 10 Nov. 2006

Link to Publication

Abstract: This paper describes innovative antenna feed development at MDA. The work addresses the need for high-performance dual-circular-polarized payloads for next-generation L and S-band mobile satellite communications. The mechanical design concept is presented, including dimensions and mass, along with the RF analyses and test measurements for a septet feed array of “cup-horns” with two coaxial diplexers. An alternative waveguide diplexer solution is also presented.

The Influence of MIMO Terminal User’s Hand on Channel Capacity

Zervos T., Alexandridis A., Peppas K., Lazarakis F.,Dangakis K., Soras C.,Lindmark B., "The Influence of MIMO Terminal User’s Hand on Channel Capacity", Proc. EuCAP Int. European Conf., Nice, France, 6 - 10 Nov. 2006

Link to Publication

Abstract: In this paper the impact of user's hand holding a multiple-input-multiple-output (MIMO) terminal on the system performance is investigated. A 4times4 MIMO system is considered with a personal digital assistant (PDA) terminal equipped with a compact array of 4 patch elements. The radiation patterns of the antenna elements are simulated in the presence of the other elements and in the presence of a user's hand. The obtained patterns are used to evaluate the covariance matrix of the receive antenna which is incorporated in a correlation-based MIMO channel model. MIMO channel capacity is calculated to demonstrate the capacity degradation caused by the user's hand.

Practical Implementation of Infinitesimal Dipole Models and Their Applications

Mikki S., Kishk A., "Practical Implementation of Infinitesimal Dipole Models and Their Applications", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 823-828, (CD ROM Edition: s26p09.pdf), Miami, Florida, 12-16 March 2006.

Link to Publication

Abstract: -

A Rigorous Solution of Uniaxial Anisotropic Dielectric Resonator Antennas

Wang D. X., Yung E. K. N., R. S. Chen., "A Rigorous Solution of Uniaxial Anisotropic Dielectric Resonator Antennas", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 800-803, (CD ROM Edition: s26p04.pdf), Miami, Florida, 12-16 March 2006.

Link to Publication

Abstract: -

Generating a High Resolution Wideband Response using RCS data from Electromagnetic Systems

Yang J. and Sarkar T. K., "Generating a High Resolution Wideband Response using RCS data from Electromagnetic Systems", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 523-526, (CD ROM Edition: s17p01.pdf), Miami, Florida, 12-16 March 2006.

Link to Publication

Abstract: -

2005

A WLAN-Used Helical Antenna Fully Integrated with the PCMCIA Carrier

Huang, C-F., Chiu, C-H., "A WLAN-used helical antenna fully integrated with the PCMCIA carrier", IEEE Trans. on Antennas and Propagat., vol. 53, no. 12, pp. 4164 – 4168, Dec. 2005.

Link to Publication

Abstract: The invention presented here is to embed the helical antenna inside an ejector of a Personal Computer Memory Card International Association (PCMCIA) carrier. The detail dimension of this antenna has been well designed to operate at the frequency 2.45 GHz, which is employed for the wireless LAN application. A low-cost electromagnetic simulation package-WIPL-D, is used to simulate this complex electromagnetic environment where the carrier metal is modeled as well, in addition to the helical antenna itself. Measurements both of return loss and radiation patterns are made too to have a comparison with the results

of simulation and to prove the design thoughts given by this paper. As a final evaluation, a PCMCIA carrier with the present design is installed into a Tablet PC to have a complete measurement.

Signal Enhancement in a Near-Field MIMO Environment through Adaptivity on Transmit

Seunghyeon, H., Medouri, A., Sarkar, T.K., "Signal enhancement in a near-field MIMO environment through adaptivity on transmit", IEEE Trans. on Antennas and Propagat., vol. 53, no. 2, pp. 685 – 693, Feb 2005.

Link to Publication

Abstract: A technique is presented on how to enhance the received signals in a near field multi-input multi-output (MIMO) environment where beam forming is not possible. This is done through the use of adaptivity on transmit. This technique is based on the principle of reciprocity, is independent of the material medium in which it is transmitting, and incorporates near-field environments and multipath. The objective here is to select a set of weights adapted to each receiver to be applied to each transmitting antenna, which is a function of the user location, so that the transmitted signal at the carrier frequency may be directed to a particular receiver location while simultaneously minimizing the received signal strengths at other receiver locations. Numerical simulations have been made to illustrate the novelty of the proposed approach.

Reconstructing a Nonminimum Phase Response from the Far-Field Power Pattern of an Electromagnetic System

Yang, J., Koh, J., Sarkar, T.K., "Reconstructing a nonminimum phase response from the far-field power pattern of an electromagnetic system", IEEE Trans. on Antennas and Propagat., vol. 53, no. 2, pp. 833 – 841, Feb. 2005.

Link to Publication

Abstract: A new technique for reconstructing the nonminimum phase function from magnitude-only data is presented in this paper. The nonminimum phase function is reconstructed by utilizing the fact that the discrete Fourier transform of the far field power pattern is equal to the autocorrelation of the equivalent spatial current distribution on the electromagnetic structure. An all-pass filter representation is also used to reduce the computational load in computing the nonminimum phase function. The solution for the phase is not unique but is up to a linear phase delay between the actual phase function and the phase produced by the current approach. However, we generate a solution which has a spatially causal response, as the antennas are all finite in size. This approach is applied to the synthesis of nonminimum phase functions from the magnitude only antenna pattern. Several examples dealing with single antennas and antenna arrays have been simulated to illustrate the applicability of this approach.

Comparative Study on the Mutual Coupling Between Different Sized Cylindrical Dielectric Resonators Antennas and Circular Microstrip Patch Antennas

Chair, R., Kishk, A.A., Lee, K-F., "Comparative study on the mutual coupling between different sized cylindrical dielectric resonators antennas and circular microstrip patch antennas", EEE Trans. on Antennas and Propagat.,vol. 53, no. 3, pp. 1011 – 1019, March 2005.

Link to Publication

Abstract: A systematic comparative study on the mutual coupling (S21) between dielectric resonator antennas (DRAs) and microstrip patch antennas is presented. The mutual coupling between two cylindrical probe-fed DRAs is studied for different radius to height (a/L) ratios. It is found that the mutual coupling decreases with the radius to height ratio. Comparison between mutual coupling of probe-fed cylindrical DRAs and circular microstrip patch antennas with different dielectric substrates are also studied. The mutual coupling between DRAs is 2 dB stronger than between microstrip patch antennas when the patch is etched on a dielectric substrate of a dielectric constant close to the permittivity of the DRA. The mutual coupling of the circular patch antennas reduces with the dielectric constant of the substrate.

Wideband simple cylindrical dielectric resonator antennas

Chair, R., Kishk, A.A., Lee, K-F., "Wideband simple cylindrical dielectric resonator antennas", Microwave and Wireless Components Letters, vol. 15, no. 4, pp. 241 – 243, April 2005.

Link to Publication

Abstract: Bandwidths of the coaxial fed and aperture coupled cylindrical dielectric resonator antennas (DRAs) with broadside radiation patterns are enhanced by exciting the HEM11Δ ($1<\Delta<2$) mode at a frequency close to the HEM11δ ($0<\delta<1$) mode. Both HEM11δ and HEM11Δ modes have similar broadside radiation patterns. Measured impedance bandwidths as much as 26.8% (S11<-10 dB) are achieved for the coaxial fed DRA and 23.7% for the aperture coupled DRA. These bandwidths are comparable to those obtained using stacked DRAs. The resonant frequency of the HEM11Δ mode can be adjusted by the radius (r) to height (h) ratio of the cylindrical DRA. A wide bandwidth is obtained when this ratio equals to 0.329.

A generalized MATLAB-based distributed-computing optimization tool

Lysiak, K., Polendo, J., "A generalized MATLAB-based distributed-computing optimization tool", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 170 – 173, (CD ROM Edition: s04p11a.pdf), Honolulu, 3-7 Apr. 2005.

Link to Publication

Abstract: A distributed computing optimization architecture was developed by SwRI for use with numerical solvers. This optimization toolbox is very generalized and can be easily adapted to use with any numerical solver having a well-described input and output file system. In combination with the use of MATLAB, this makes it a very flexible and powerful analysis and development tool. The tool employs an optimization

routine, input file modification routines to generate numerous solver input files, and output extraction routines to extract the pertinent solver output data. Specifically, advanced development has been done using the numerical electromagnetic code (NEC) ante wire/plate with dielectrics (WIPL-D), genetic algorithm optimization toolbox (GAOT) and CONDOR® to demonstrate proof-of-concept.

High performance low cost ferroelectric phase shifters designed for simple biasing

Wayne, K., W., Iskander, M.F., Tanaka, C., "High performance low cost ferroelectric phase shifters designed for simple biasing", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 120 – 123, (CD ROM Edition: s03p11a.pdf), Honolulu, 3-7 Apr. 2005

Link to Publication

Abstract: A novel approach in ferroelectric phase shifters design using BaxSr1-xTiO3 (BSTO) films in a multilayer dielectric coplanar waveguide structure is described. By including a low loss dielectric layer (SiO2) between the coplanar waveguide conductors and the ferroelectric material in conjunction with a via to allow the signal conductors to contact the ferroelectric layer to employ biasing, significant reduction in insertion loss can be achieved in conjunction with a three fold increase in figure of merit (/dB) compared to the case with direct metallization on the ferroelectric layer.

FDTD analysis of a probe-fed dielectric resonator antenna in rectangular waveguide

Zhang, Y., Kishk, A.A., Yakovlev, A.B., Glisson, A.W., "FDTD analysis of a probe-fed dielectric resonator antenna in rectangular waveguide", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 371 – 375, (CD ROM Edition: s11p02a.pdf), Honolulu, 3-7 Apr. 2005.

Link to Publication

Abstract: A probe-fed dielectric resonator antenna (DRA) element is investigated for operation in a waveguide environment with application to spatial power combining amplifier arrays. The method of analysis is based on the finite-difference time-domain (FDTD) approach, wherein a rectangular waveguide and DRA are discretized by using a traditional Yee cell griding and a coaxial line is modeled by a thin wire approximation. The input impedance and scattering parameters are studied by varying geometrical and material parameters of the DRA and the coaxial probe feed. The numerical results obtained by the proposed FDTD method are compared with those generated by using a commercial software and exhibit very good agreement.

Broadband dielectric resonator antennas excited by L-shaped probe

Kishk, A.A., Chair, R., Lee K-F., "Broadband dielectric resonator antennas excited by L-shaped probe", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 365 – 370, (CD ROM Edition: s11p01a.pdf), Honolulu, 3-7 Apr. 2005.

Link to Publication

Abstract: Dielectric resonator antennas (DRA) designed for broadband applications and excited by L-shape probe are analyzed numerically. The L-probe is housed under a free space groove between the DRA and the ground plane. A 32% matching bandwidth is achieved with broadside radiation patterns. The new structure is mechanically better than other wideband DRA antennas.

Modeling an HF NVIS Towel-Bar Antenna on a Coast Guard Patrol Boat: a Comparison of WIPL-D and the Numerical Electromagnetics Code

Mora, D., Weiser, C., McKaughan, M., "Modeling an HF NVIS towel-bar antenna on a coast guard patrol boat: a comparison of WIPL-D and the numerical electromagnetics code (NEC)", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 140 – 143, (CD ROM Edition: s04p05a.pdf), Honolulu, 3-7 Apr. 2005.

Link to Publication

Abstract: A coast guard patrol boat high-frequency (HF) near-vertical incident skywave (NVIS) antenna is selected as a test case to compare the electromagnetic modeling programs numerical electromagnetics code, NEC and WIPL-D code. Differences between the models and program outputs are presented. The radiation pattern predictions are compared. Agreement between the results is found to be good. Minor adjustments of the two coordinate systems of the programs are necessary. A summary of the comparison is presents.

WIPL-D Results and Time Domain Response for an Impulse Radiating Antenna (IRA)

Taylor, M.C., Sarkar, T.K., "WIPL-D results and time domain response for an impulse radiating antenna (IRA)", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 110 – 113, (CD ROM Edition: s03p09a.pdf), Honolulu, 3-7 Apr. 2005.

Link to Publication

Abstract: WIPL-D was used to model and simulate an impulse radiating antenna (IRA) with a 46 cm diameter paraboloidal reflector and 45 degree feed arms. Model views are shown and the results of frequency domain simulation up to 20 GHz are plotted for the two cases of the IRA as transmitter and as receiver. The simulated frequency domain data is inverse Fourier transformed to obtain the time domain response to a Gaussian pulse input. The integral of the pulse input response gives the step response, which compares well with the theorized step input response of the IRA.

WIPL-D Parallelization Effort

Card, C., "WIPL-D parallelization effort", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 102 – 105, (CD ROM Edition: s03p07a.pdf), Honolulu, 3-7 Apr. 2005.

Link to Publication

Abstract: This paper presents the results of the final year of a development effort to provide a scalable, portable, parallel scene generation tool that provides the capability to rapidly generate scenes of radiating and scattering structures in realistically complex electromagnetic environments. The benefit of such a tool is that it provides users with the capability to solve large problems that cannot be currently solved with existing sequential electromagnetic modeling tools. This tool supports a broad range of users including researchers, algorithm developers, analysts, and system developers. This paper presents the parallelization process and shows the final results of the project. The project presented here is the parallelization of WIPL-D, an electromagnetic modeling tool, which picks up in time from where C. Card (2004) left off. Through parallelization, the well known and commercially available tool became faster and now possesses increased capabilities. This paper will walk you through the parallelization process, providing the strategies used and the results received.

Electrically Large Structures in WIPL-D

Yuan, M., Sarkar, T.K., "Electrically large structures in WIPL-D", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 82 – 85, (CD ROM Edition: s03p02a.pdf), Honolulu, 3-7 Apr. 2005

Link to Publication

Abstract: In this paper, an electrically large structure, a 50-λ (where λ is the wave length) long airplane and a dual-polarized 60-element Vivaldi array are run in 64-bit version WIPL-D® software on the Intel® Itanium2® platform with 64GB physical memory. The scattering electromagnetic parameters (the RCS, the surface current, and the near field) and the radiation pattern are shown. The memory usage and the CPU times for different number of unknowns larger than the limit of 32-bit PCs are listed. We also show that this 64-bit version of WIPL-D can go beyond the 64GB physical memory and the speed is not significantly decreased when the virtual memory is used.

Equalization of Numerically Calculated Element Patterns for Root-Based Direction Finding Algorithms

Abdallah, H.A., Wasylkiwskyj, W., Kopriva, I., "Equalization of numerically calculated element patterns for root-based direction finding algorithms", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 98 – 101, (CD ROM Edition: s03p06a.pdf), Honolulu, 3-7 Apr. 2005.

Link to Publication

Abstract: -

Deep Ground Penetrating Radar (GPR) WIPD-D Models of Buried Sub-Surface Radiators

Norgard, J.D., Wicks, M.C., and Musselman, R.L., "Deep ground penetrating radar (GPR) WIPD-D models of buried sub-surface radiators", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 114 – 119, (CD ROM Edition: s03p10a.pdf), Honolulu, 3-7 Apr. 2005.

Link to Publication

Abstract: The proliferation of strategic subsurface sanctuaries has increased the need for enhanced remote sensing techniques providing for the accurate detection and identification of deeply buried objects. A new ground penetrating radar (GPR) concept is proposed in this paper to use subsurface radiators, delivered as earth penetrating non-explosive, electronic "e-bombs", as the source of strong radiated transmissions for GPR experiments using ground contact or airborne receivers. Three-dimensional imaging techniques for deeply buried targets are being developed based on two-dimensional synthetic aperture radar (SAR) data collection techniques. Experiments over deep mine shafts have been performed to validate the 2D SAR processing algorithms. WIPL-D models have been used to verify the significant enhancement in the received signal-to-noise ratio obtained by burying the transmitter under the surface of the earth. Simple ray-tracing techniques have also been used to confirm the enhancements.

Analysis of Dipole Antenna Printed on Thin Film by Using Electromagnetic Simulators

Taguchi, M., Matsunaga, Y., "Analysis of dipole antenna printed on thin film by using electromagnetic simulators", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 78 – 81, (CD ROM Edition: s03p01a.pdf), Honolulu, 3-7 Apr. 2005.

Link to Publication

Abstract: The printed dipole antenna on thin polyimide film is calculated by using WIPL-D and IE3D based on the method of moment, micro-stripes based on TLM method Its input impedance characteristics are compared with measured data and discussed.

Beta Test Analysis of WIPL-DP

Tabet, S.N., Card, C., "Beta test analysis of WIPL-DP", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 106 – 109, (CD ROM Edition: s03p08a.pdf), Honolulu, 3-7 Apr. 2005.

Link to Publication

Abstract: During the Beta Test (BT) phase, WIPL-D [B.M. Kolundzija et al., 2000] was parallelized for matrix fill/solution, to supplement the frequency parallelization developed in the Alpha Test (AT) phase [S. Tabet et al. April 2004]. The new WIPL-DP code was required to run on three distinct HPC platforms. The BT phase was the final testing phase of WIPL-DP5 since the IOT&E was eliminated from the requirements. WIPL-DP was successfully parallelized for frequency and matrix fill/solution. The revised code received threshold level (or better) performance rating for all critical technical parameters (CTPs) tested. The chosen test case for the BT

phase was a further modification to the version used in the AT phase of the "human head adjacent to a cellular phone" (DEMO-531) problem. This WIPL-DP effort was funded under the common high performance computing software support initiative (CHSSI) as described in S. Tabet et al. (2004). The goal of this initiative was to provide efficient, scalable, portable software codes, algorithms, tools, models and simulations that can run on a variety of DOD high performance computing platforms that can be used by scientists and engineers to solve computing problems.

High Performance Low Cost Ferroelectric Phase Shifters Designed for Simple Biasing

Wayne, K., Iskander, M. F., Tanaka C., "High performance low cost ferroelectric phase shifters designed for simple biasing", Proc. of IEEE/ACES Conf. on Wireless Comm. and Appl. Commput. Electromag., pp. 120 – 123, CD ROM Edition: s03p11a.pdf, Honolulu, Apr. 2005.

Link to Publication

Abstract: A novel approach in ferroelectric phase shifters design using BaxSr1-xTiO3 (BSTO) films in a multilayer dielectric coplanar waveguide structure is described. By including a low loss dielectric layer (SiO2) between the coplanar waveguide conductors and the ferroelectric material in conjunction with a via to allow the signal conductors to contact the ferroelectric layer to employ biasing, significant reduction in insertion loss can be achieved in conjunction with a three fold increase in figure of merit (/dB) compared to the case with direct metallization on the ferroelectric layer.

Extracting Electrical Material Parameters of Electrically Large Dielectric Objects from Reverberation Chambers of Measurements of Absorptions Cross Section

Hallbjorner, P., Carlberg, U., Madsen, K., Andersson, J., "Extracting electrical material parameters of electrically large dielectric objects from reverberation chamber measurements of absorption cross section", IEEE Trans. on Electromagnetic Compatibility, vol. 47, no 2, pp. 291 – 303, May 2005.

Link to Publication

Abstract: Reverberation chambers can be used to measure the absorption cross section of a dielectric object. The absorption cross section of a dielectric object depends on its size, shape, and electrical material parameters. By comparing with a theoretical model of the absorption cross section, material parameters can be extracted from measurements. A model based on a plane wave approach of incident fields is used here, valid for electrically large material samples in an isotropic environment such as that in a reverberation chamber. Which material parameter can be extracted depends on the properties of the material sample. The presented method combines the accuracy of cavity methods with the flexibility of being able to measure samples of arbitrary size and shape. Because both the reverberation chamber and the material sample are electrically large, the method is particularly useful at millimeter-wave frequencies.

Signal Enhancement through Polarization Adaptivity on Transmit in a Near-Field MIMO Enviroment

Seunghyeon, H. and Sarkar, T.K., "Signal enhancement through polarization adaptivity on transmit in a near-field MIMO environment", Proc. IEEE AP-S Int. Symp., vol. 2A, pp. 301 – 304, (CD ROM Edition: s048p02a.pdf), Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: In this paper polarization adaptivity on transmit has been used to enhance the received signals directed to a pre-selected receiver in a near-field multi-input multi-output (MIMO) environment. The objective here is to select a set of weights on the transmitting antennas adapted to each receiver based on the principles of reciprocity. Using the polarization properties, when the number of receiving antennas is greater than the number of transmitting antennas, the transmitted signal may be directed more to a particular receiver location while simultaneously minimizing the reception signal strength at other receivers. A numerical simulation has been made to illustrate the novelty of the proposed approach.

Modeling General Purpose Antennas as Ainimum-Scattering Antennas

Allen, O.E., "Modeling general purpose antennas as minimum-scattering antennas", Proc. IEEE AP-S Int. Symp., vol. 3B, pp. 47-50, (CD ROM Edition: s088p04a.pdf), Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: A minimum-scattering antenna model is found to provide an excellent approximation of the mutual impedance between two very common types of general-purpose antennas.

Mutual Impedance and Element Patterns of Probe-Fed Patch Antenna Arrays Based on the Characteristics of an Isolated Element

Abdallah, H.A., Wasylkiwskyj, W., "Mutual impedance and element patterns of probe-fed patch antenna arrays based on the characteristics of an isolated element", Proc. IEEE AP-S Int. Symp., vol. 4A, pp. 317 – 320, (CD ROM Edition: s117p03a.pdf), Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: A numerical technique for calculating mutual impedances and element patterns of antenna arrays based on the characteristics of an isolated element is presented. Numerical results are presented for arrays of rectangular probe-fed patch antennas and a comparison is made with a direct calculation using the WIPL-D code, showing good agreement.

Monostatic Through-Wall Detection of a Metallic Sphere

Yacoub, H.E., Sarkar, T.K., "Monostatic through-wall detection of a metallic sphere", Proc. IEEE AP-S Int. Symp., vol. 3B, pp. 326 – 329, (CD ROM Edition: s099p06a.pdf), Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: The paper introduces a time-domain technique and a homomorphic (cepstrum-domain) technique for detecting a metallic sphere placed behind a lossy dielectric wall. Both of them rely on the monostatic analysis of the scattered electromagnetic waves from an electromagnetic impulse incident on the wall. The performance of the two approaches are compared at various distances from the wall.

A Novel Long Slot Antenna

Johnston, R.H., Rao Q., Denidni, T.A., Sebak, A.R., "A novel long slot antenna", Proc. IEEE AP-S Int. Symp., vol. 3A, pp. 679 – 682, (CD ROM Edition: sp64p07a.pdf), Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: An electrical long slot antenna of novel structure is proposed. Half wave slots are interconnected with a phase reversing section consisting of quarter wave slot stubs and crossover wires. These sections ensure that adjacent half wave sections of the slot radiator produce in-phase radiation. The resulting structure produces two main lobes (forward and backward) with minimal minor lobes. A shielding structure can modify the radiation pattern to provide one main lobe.

Study of the Shaped Probe on the Cup Dielectric Resonator Antenna for Bandwidth Enhancement

Kishk, A.A., Chair, R., Lee, K-F., "Study of the shaped probe on the cup dielectric resonator antenna for bandwidth enhancement", Proc. IEEE AP-S Int. Symp., vol. 4B, pp. 222 – 225, (CD ROM Edition: s137p04a.pdf), Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: Dielectric resonator antennas (DRA) are attractive at high frequencies. They can be designed with different shapes, but have the drawback of narrow bandwidths, typically around 10%. A wide range of materials is available to control the size and the bandwidth. One method of excitation is the coaxial probe, which is usually placed inside the DRA. It can be difficult to drill a small hole for the probe in ceramic materials, especially if the hole is close to the wall. Deformation of the DRA geometry from regular shapes can be used to enhance the bandwidth. Instead of drilling a small hole in the DRA, we modify the shape of the DRA to contain an easily machined groove which is large enough to house the shaped probe. Several probe shapes are investigated. It is found that L-, J- or hook-shaped probes can enhance the bandwidth of the DRA and excite a broadside-radiating mode. A single probe achieves a bandwidth around 30%. Using two orthogonal probes excites two orthogonal modes for dual polarization and further enhances the bandwidth. A wideband dually polarized DRA was studied and a bandwidth of 30-50% was achieved.

Antennas for RF Mote Communications

Johnston, R.H., Haslett, J.W., "Antennas for RF mote communications", Proc. IEEE AP-S Int. Symp., vol. 4A, pp. 267 – 270, (CD ROM Edition: s115p10a.pdf), Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: Compact RF communicators with integral sensing systems are attracting substantial interest for monitoring medical patients, environmental parameters and material flow. These devices, known as wireless motes are very small with their built in antennas. Significant factors in their effectiveness are the size and efficiency of their antennas. This paper proposes a modified antenna for mote applications.

WIPL-D Model and Simulation Results for a 46cm Diameter Impulse Radiating Antenna (IRA)

Taylor, M.C., Sarkar, T.K., "WIPL-D model and simulation results for a 46cm diameter impulse radiating antenna (IRA)", Proc. IEEE AP-S Int. Symp., vol. 1A, pp. 553 – 556, (CD ROM Edition: sp06p04a.pdf), Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: WIPL-D was used to model and simulate an impulse radiating antenna (IRA) with a 46cm diameter paraboloidal reflector and 45 degree feed arms. Model views are shown and the results of frequency domain simulation up to 20GHz are shown to agree with results from published measurements. Beam patterns at three frequencies show the highly directional behavior of this antenna. The simulated frequency domain data is inverse Fourier transformed to obtain the time domain response to a Gaussian pulse input. This response is integrated to obtain the response to a step input, which compares well with the theorized step input response of the IRA.

An Efficient Numerical Technique for Calculating Mutual Coupling in Antenna Arrays Based on the Characteristics of an Isolated Element

Abdallah, H.A., Wasylkiwskyj, W., "An efficient numerical technique for calculating mutual coupling in antenna arrays based on the characteristics of an isolated element", Proc. IEEE AP-S Int. Symp., vol. 3B, pp. 43 – 46, (CD ROM Edition: s088p03a.pdf), Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: An efficient numerical technique for calculating mutual coupling in antenna arrays based on the characteristics of an isolated element is presented. Numerical results for linear arrays of collinear and parallel electric dipole antennas (that is also extendable to other antenna types) are presented and a comparison is made with calculations using the WIPL-D code.

A Multi-Element Coplanar Waveguide Continuous Transverse Stub (CPW-CTS) Antenna for Wireless Communications

Wayne, K., Iskander, M. F., "A multi-element coplanar waveguide continuous transverse stub (CPW-CTS) antenna for wireless communications", Proc. IEEE AP-S Int. Symp., CD ROM Edition: s012p07a.pdf, Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: A three element CPW-CTS array antenna is described. The advantages of this new design include low cost, low profile, light weight, and a very simple planar microstrip feed configuration. The three element antenna exhibits a well-formed broadside main beam with up to 31% decrease in HPBW (compared to a single element CPW-CTS) at the 10 GHz frequency band and good 50-ohm impedance match (-10 dB) from 9.9 to 10.3 GHz. For future work, experimental verification will be performed and measured data will be compared with simulated results. The multi element CPW-CTS array represents the first step towards a large multi-panel planar array.

Evolutionary Design of a Single-Wire Circularly-Polarized X-band Antenna for NASA's Space Technology 5 Mission

Lohn, J. D., Linden D. S., Hornby G. S., Rodriguez-Arroyo A., Seufert S. E., Blevins B., Greenling T., "Evolutionary design of a single-wire circularly-polarized X-band antenna for NASA's space technology 5 mission", Proc. IEEE AP-S Int. Symp., CD ROM Edition: s062p04a.pdf, Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: A four-arm symmetric evolved antenna was presented previously to satisfy NASA's Space Technology 5 mission (Lohn, J.D. et al., 2004). However, the mission's launch vehicle was changed, putting it into a much lower Earth orbit, changing the specifications for the communications antenna. Within one month of this change, two new antennas were evolved and prototyped. Both were tested, and both had acceptable performance with respect to the new specifications This rapid response shows that this design process is able to accommodate new requirements quickly.

Performance Evaluation of the Second Order and Fourth Order Statistics Based Root MUSIC Algorithms in the Presence of Mutual Coupling

Kopriva, I., Wasylkiwskyj, W., Abdallah, H., "Performance evaluation of the second order and fourth order statistics based root MUSIC algorithms in the presence of mutual coupling", Proc. IEEE AP-S Int. Symp., CD ROM Edition: s131p05a.pdf, Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: Direction finding (DF) algorithms based on polynomial rooting implicitly assume equality among the element radiation patterns. However, in real antenna arrays this equality is violated due to the phenomenon known as mutual coupling that can significantly deteriorate accuracy of the root DF algorithms. In this paper

we compare robustness of the second order (SO) and fourth order (FO) statistics based root MUSIC algorithms in the presence of the various levels of mutual coupling among the elements of the uniform linear array (ULA). It has been demonstrated that FO root MUSIC algorithm exhibits significantly higher level of robustness in the presence of mutual coupling when number of sources is greater than one.

Design of Dielectric Resonator Antenna Array Excited by Waveguide Probes

Eshrah, I. A., Kishk, A. A., Yakovlev A. B., Glisson A. W., "Design of Dielectric Resonator Antenna Array Excited by Waveguide Probes", Proc. IEEE AP-S Int. Symp., (CD ROM Edition: sp44p03a.pdf), Washington, 3-8 Jul. 2005.

Link to Publication

Abstract: Waveguide-fed phased antenna arrays are typically used in high frequency applications. The paper proposes a design procedure for probe-fed dielectric resonator antenna (DRA) arrays using equivalent circuit modeling for the feeding network, to exploit the features of circuit simulators in the array synthesis problem. From the desired specifications of the radiation pattern, the adopted synthesis technique is used to determine the relative feeding currents of the DRA array elements. Then using optimization, the equivalent circuit parameters are determined and are subsequently interpreted as physical dimensions and positions of the probes. The results obtained assuming that the DRAs are isolated are compared to those obtained taking into consideration the external mutual coupling, showing that the radiation pattern and the scattering parameters are not significantly affected by the external coupling.

A New Coplanar Waveguide Continuous Transverse Stub (CPW-CTS) Antenna for Wireless Communications

Wayne, K., Iskander, M.F., "A new coplanar waveguide continuous transverse stub (CPW-CTS) antenna for wireless communications", IEEE Trans. on Antennas and Propagat., vol. 4, pp. 172 – 174, 2005.

Link to Publication

Abstract: To address the continuing demand for low-cost, light-weight and high-performance antennas, and multiband antenna arrays for wireless communications, we developed a new design of the continuous transverse stub (CTS) antenna technology. The design is based on a coplanar waveguide (CPW) feed which combines the advantages of the planar designs originally developed by Hughes Aircraft and the newer 50 Ω coaxial version recently developed by our group . To examine the feasibility of the approach, a one-element CPW-CTS antenna is designed and a prototype is built in the frequency range of 5.2-5.6 GHz. S-Parameters and radiation pattern results shows good agreement between the simulation results and the experimental data.

Compact Antenna for Radar-Based Breast Cancer Detection

Yun, X., Fear, E.C., Johnston, R.H., "Compact Antenna for Radar-Based Breast Cancer Detection", IEEE Trans. on Antennas and Propagat.,vol. 53, no. 8, part 1, pp. 2374 – 2380, Aug. 2005.

Link to Publication

Abstract: Microwave imaging for breast cancer detection is based on the contrast in electrical properties of healthy fatty breast tissues and malignant tumors. This inherent contrast causes microwave reflections from tumors embedded in normal tissues. Radar-based breast imaging detects tumors by observing variations in microwave signals reflected from the tumors as the antenna location changes. The topics of this paper are the development of a compact antenna for the detection of cross-polarized reflections and the application of this antenna to radar-based breast cancer detection. The antenna is designed, simulated, constructed and measured. The capabilities and limitations of the antenna for detecting tumor models are investigated through simulation and experiments, demonstrating the potential of this method for the detection of tumors in the breast.

A Numerical Technique for Calculating Mutual Impedance and Element Patterns of Antenna Arrays Based on the Characteristic of an Isolated Element

Abdallah, H.A., Wasylkiwskyj, W., "A numerical technique for calculating mutual impedance and element patterns of antenna arrays based on the characteristics of an isolated element", IEEE Trans. on Antennas and Propagat., vol. 53, no. 10, pp. 3293 – 3299, Oct. 2005.

Link to Publication

Abstract: A numerical technique for calculating mutual impedance and element patterns of antenna arrays based on the characteristics of an isolated element is presented. The basis for this technique is the theory of minimum-scattering (MS) antennas and, in particular, the interpretation of the mutual impedance between two canonical minimum-scattering (CMS) antennas as the first term in a perturbation series of the mutual impedance of arbitrary antennas. For the computation of the mutual impedance via the CMS approximation this pattern must be continued analytically into the complex domain. However, numerical codes provide radiation patterns only for real observation angles. To overcome this problem, the numerically calculated patterns are expanded in terms of spherical modes and the computation over complex angles is carried out analytically. Numerical results for collinear and linear arrays of parallel electric dipole antennas and rectangular probe-fed patch antennas are presented and a comparison is made with direct calculations using the WIPL-D code. Results presented show the good agreement between the CMS approximation and the WIPL-D code.

2004

Analysis of Scattering from Three-Dimensional Conducting Bodies Coated with a Dielectric Material

Jung, B. H., Sarkar, T. K., Ji, Z., and Salazar-Palma, M., "Analysis of Scattering from Three-Dimensional Conducting Bodies Coated with a Dielectric Material", Proc. of ACES Int Symp., CD ROM Edition: S05P01.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: In this paper, we present the analysis of electromagnetic scattering from arbitrarily shaped three-dimensional (3-D) conducting objects coated with dielectric materials. The integral equation treated here is the combined field integral equation (CFIE). The objectives of this paper is to illustrate that only the CFIE formulation is a valid methodology in removing defects, which occur at a frequency corresponding to an internal resonance of the structure. Numerical results of radar cross sections (RCS) for coated conducting structures are presented and compared with other available solutions.

A Broadband Flat Dipole Antenna with an Asymmetrical feed

Yoshida, F. and Hirasawa, K., "A broadband flat dipole antenna with an asymmetrical feed", Proc. of ACES Int Symp., CD ROM Edition: S06P03.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: -

Reconstructing of a Non-Minimum Phase Response from Far-Field Power Pattern of an Electromagnetic System

Yang, J. and Sarkar, T. K., "Reconstructing of a non-minimum phase response from far-field power pattern of an electromagnetic system", Proc. of ACES Int Symp., CD ROM Edition: S09P09.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: A new technique for reconstructing the non-minimum phase function from magnitude-only data is presented in this paper. The non-minimum phase is reconstructed by utilizing the fact that the DFT of the square of magnitude response is equal to the auto-correlation of time domain sequence. An all-pass filter representation is also used to reduce the computational load. This approach is applied to the synthesis of non-minimum phase functions from the magnitude only antenna pattern. Several examples dealing with a single antenna and antenna arrays are simulated to illustrate the applicability of this approach.

Optimization of Three-Dimensional TEM Cell for Electromagnetic Compatibility Testing

Deniau, V., "Optimization of three-dimensional TEM cell for electromagnetic compatibility testing", Proc. of ACES Int Symp., CD ROM Edition: S10P01.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: This paper illustrates the possibilities offered by WIPL-D code to characterize the electromagnetic behaviour of Electromagnetic Compatibility (EMC) test facilities and to determine their optimal design. The

test facility considered in this paper is the three-dimensional TEM cell, which was patented by INRETS in 2000. This paper aims to highlight the advantages of using WIPL-D code in the different development steps of this new test facility. The precision of the results given by WIPL-D code will be examined through experimental and numeric comparisons.

Design of Wideband Printed Monopole Antenna Using WIPL-D

Sharkawy, Al M. H., Eldek, A. A., Elsherbeni, A. Z., and Smith, C, E., "Design of wideband printed monopole antenna using WIPL-D", Proc. of ACES Int Symp., CD ROM Edition: S10P02.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: For the purpose of wideband operations, a printed monopole antenna fed by a microstrip line is investigated. A single element is studied before using it to form a linear array or two-dimensional antenna array system. The antenna element has a single T-shaped radiator fed by a microstrip line. This design is found to be useful for the entire C-band frequency range centered at 6 GHz. The computed return loss is presented that shows a bandwidth of 77%, with a 50 Ω input impedance. The radiation pattern is as presented for the proposed antenna at 6 GHz exhibits very low cross polarization. The effect of varying the monopole dimensions on the antenna performance has also been studied. The single element design was analyzed using the WIPL-D software package, which is based on method of moment solution.

Comparison of Return Loss Calculations with Measurements of Narrow-Band Microstrip Patch Antennas

Abdallah, H., Wasylkiwskyj, W., Parikh, K., and Zaghloul, A., "Comparison of return loss calculations with measurements of narrow-band microstrip patch antennas", Proc. of ACES Int Symp., CD ROM Edition: S10P04.pdf, Syracuse, 19-23 Apr. 2004.

Link to Publication

Abstract: The return loss of rectangular, single- layer, coax- fed patch antennas designed to resonate at 1904 MHz was computed using WIPL-D and HFSS and the results compared with experiment. It was found that neither WIPL-D nor HFSS estimates the bandwidth and the resonant frequency with sufficient accuracy. However, the resonant frequency predicted by WIPL-D was found to be closer to the experimental value than predicted by HFSS.

Novel High Performance Low Cost Phase Shifters Design Based on the Ferroelectric Materijals Technology Using the WIPL-D Code

Wayne, K. and Iskander, M., "Novel high performance low cost phase shifters design based on the ferroelectric materials technology using the WIPL-D Code", Proc. of ACES Int Symp., CD ROM Edition: S10P05.pdf, Syracuse, 19-23 Apr. 2004.

Link to Publication

Abstract: A novel approach in ferroelectric phase shifter designs using BaxSr1-xTiO3 (BSTO) films in a multilayer dielectric environment is described. It is shown that by including a low loss dielectric layer (SiO2) between the coplanar waveguide conductors and the ferroelectric material, significant reduction in the insertion loss can be achieved and as high as three fold increase in the figure of merit (o/dB) is possible to realize. The phase shifter design involves a BSTO thin film over a LaAlO3 substrate for low strain and lattice match. A reduction in the insertion loss by approx. 5 dB/cm for high εr ferroelectric materials, and a decrease in return loss by 20 dB were observed at 10 GHz. Design tradeoffs and fabrication aspects will be discussed.

Dual State Resonator Design for Plasma Ignition by Means of Microwave Energy

Klukas, R., "Dual state resonator design for plasma ignition by means of microwave energy", Proc. of ACES Int Symp., CD ROM Edition: S10P06.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: The paper describes the design of an microwave plasma ignition appliance to be used for gas discharge lamps. Field theoretical aspects are treated for the topology required to obtain ignition, also, the conductance of the plasma lamp is considered in the prior to- and after- ignition states. A solution is presented which offers coupling in of microwave energy for both conditions. The electromagnetic code WIPL has been used for the design steps.

Modeling of Ceramic Filters Using WIPL-D

Vangala, R., "Modeling of ceramic filters using WIPL-D", Proc. of ACES Int Symp., CD ROM Edition: S10P08.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: Result page: 1

Microstrip Line Junctions - A Comparison of WIPL-D Simulations and Measured Data

Johnson, R. H., "Microstrip Line Junctions - A comparison of WIPL-D simulations and measured data ", Proc. of ACES Int Symp., CD ROM Edition: S10P09.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: Microstrip line junctions such as corners and Tees are numerically simulated using WIPL-D. The derived scattering parameters are compared with measured and de-embedded scattering parameters of the same junctions. Very good agreement between the simulations and measurements are obtained.

Numerical Analysis of Microstrip Antenna by Using Electromagnetic Simulators

Taguchi, M., Ichikawa, K., and Tanaka, K., "Numerical analysis of microstrip antenna by using electromagnetic simulators", Proc. of ACES Int Symp., CD ROM Edition: S10P10.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: The probe-fed truncated square patch microstrip antenna is calculated by using WIPL-D based on the method of moment, Micro-Stripes based on TLM method and Fidelty based on FDTD method. Its input impedance and radiation characteristics are compared and discussed.

Development of a Parallel Scene Generation Electromagnetic Modeling Tool

Card, C., "Development of a parallel scene generation electromagnetic modeling tool", Proc. of ACES Int Symp., CD ROM Edition: S12P02.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: This paper presents the results to date of an on-going development effort to provide a scalable, portable, parallel scene generation tool that will provide the capability to rapidly generate scenes of radiating and scattering structures in realistically complex electromagnetic environments. The benefit of such a tool is that it will provide users with the capability to solve large problems that cannot be currently solved with existing sequential electromagnetic modeling tools, This tool supports a broad range of users including researchers, algorithm developers, analysts, and system developers. This paper will present the parallelization process highlighting the strategies used and will show the results to date. The project presented here is the parallelization of WIPL-D, an electromagnetic modeling tool. Through parallelization, the well known and commercially available tool will become faster and possess increased capabilities. This paper will walk you through the parallelization process, providing the strategies used and the results received.

Alpha Test Analysis of WIPL-DP

Tabet, S., Joiner, L., and Benincasa, M., "Alpha test analysis of WIPL-DP", Proc. of ACES Int Symp., CD ROM Edition: S12P03.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: WIPL-D (WIre PLate Dielectric) has become an increasingly popular Method of Moments (MoM) code used in computational electromagnetics (CEM) modeling. WIPL-D was chosen for parallelization under the Common High Performance Computing Software Support Initiative (CHSSI) program of the High Performance Computing Modernization Office (HPCMO). Hence, the new code was given the name WIPL-DP, where \"P\" stands for Parallelized. Any computer code chosen for parallelization under the CHSSI program must undergo four rigorous phases of testing: Software Acceptance Test, Alpha Test (AT), Beta Test (BT), and

Initial Operational Test and Evaluation (IOT&E). WIPL-DP is currently undergoing those tests, with the Alpha Test recently completed and reported on in this effort. The Beta Test and the IOT&E are to be completed by 30 September 2004. WIPL-DP is a parallelized C/C++ version of the original FORTRAN 77 WIPL-D code. During the Alpha Test period, WIPL-DP was successfully parallelized for frequency. It also received optimal performance rating for the following Critical Technical Parameters (CTPs): scalability; portability; and correctness, stability, and accuracy. The chosen test case for the Alpha Test was a modified version of the "Human Head Adjacent to a Cellular Phone" (DEMO-531) problem available under the tutorial sub-directory in the PC version of the WIPL-D software. The Alpha Test was performed on two distinct High Performance Computing (HPC) platforms, Tempest and Huinalu, both at the Maui HPC Center.

Preliminary Calculated Scatter from Trihedral Corner Reflector with WIPL-D

Mokole, E. L., Gold, B. T., and Sarkar T. K., "Preliminary calculated scatter from trihedral corner reflector with WIPL-D", Proc. of ACES Int Symp., CD ROM Edition: S12P04.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: WIPL-D is being used to compute monostatic and bistatic radar cross sections of a trihedral corner reflector over the frequency range of 1-12 GHz. Initial results are discussed for vertically and horizontally polarized fields at two frequencies (1.5 and 3.8 GHz). These computations are being used to provide a benchmark against which the performance of WIPL-DP, a parallelized version of the WIPL-D, may be compared. Recently, sea-scatter data was collected from 1.9-11.5 GHz with trihedral reflectors. Since the WIPL-D calculations discussed here, as well as planned calculations, will be used to provide predictions of sea scatter that will be compared to the actual data, the sea-scatter geometry is described.

Low-Frequency Synthetic Aperture Radar Imaging of Complex Scenes Using Numerical Electromagnetic Analysis

Simcoe, M., Adve, R., Schneible, J., and Wicks, M., "Low-frequency synthetic aperture radar imaging of complex scenes using numerical electromagnetic analysis", Proc. of ACES Int Symp., CD ROM Edition: S12P05.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: This work develops the high-fidelity simulation capability for low-frequency synthetic aperture radar (SAR) imaging of complex scenes including both metal and dielectric regions. The simulation is based on a Method of Moments (MOM) numerical electromagnetic analysis of scenes where metal targets are obscured by foliage modeled as dielectric. The ability to accurately model the interaction of foliage and target is crucial for an accurate simulation. Example scenes for isolated metal targets are provided in addition to scenes with combined metal and dielectric targets. As expected, the effect of the surrounding foliage is shown to have a significant impact on the reconstructed target image. This approach will be useful in low-frequency SAR applications for the prediction of target signatures under various conditions of concealment.

Array Antenna Design with WIPL-D

Schuman, H. K., McPherson D., and Hinman K., "Array antenna design with WIPL-D", Proc. of ACES Int Symp., CD ROM Edition: S12P06.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: Array antenna design at Syracuse Research Corporation using WIPL-D is demonstrated by two examples: a switched beam conformal array and a phased array. The conformal array is a cylindrical array of vertical column subarrays. The phased array is planar array of microstripline integrated balun dipoles. In both cases, theory is compared with measurement.

Investigation of a Forward Looking Conformal Broadband Antenna for Airborne Wide Area Surveillance

Yacoub, H. E., "Investigation of a forward looking conformal broadband antenna for airborne wide area surveillance", Proc. of ACES Int Symp., CD ROM Edition: S12P07.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: The presented work describes an antenna with 2:1 bandwidth (400-800 MHz) that will be used in airborne wide area surveillance. Several designs of the Log-Periodic configuration are introduced in addition to a TEM Horn. Performance parameters like bandwidth, beamwidth, gain and input impedance are discussed for all the designs.

Metallic vs. Dielectric Modeling in WIPL-D

Taylor, M. C., "Metallic vs. dielectric modeling in WIPL-D", Proc. of ACES Int Symp., CD ROM Edition: S12P08.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: Simulations were run in WIPL-D [1] using homogeneous metallic or dielectric material separately with the same scattering structure at grazing angle. The frequency domain (FD) data was processed with Gaussian windowing and the inverse discrete Fourier transform. The resulting time domain (TD) plots are compared. The conclusion is that a metallic structure simulation can provide information relevant to the dielectric structure in much less time using fewer unknowns. An approximation for the structure\'s observed resonance is discussed.

Comparison of WIPL-DP Calculations with EMCC and NRL Measured Data

Taylor, D. J., "Comparison of WIPL-DP calculations with EMCC and NRL measured data", Proc. of ACES Int Symp., CD ROM Edition: S12P09.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: The parallel version of WIPL-D has been used to predict scattering from a series of simple shapes for which measured scattering data exists for comparison. Where possible, the comparisons are augmented with the results of predictions made with other computer codes, including the serial version of WIPL-D run on a desktop personal computer. The focus of this exercise was to quantify the accuracy and convergence properties of the parallel version of WIPL-D while measuring the computational advantage obtained by using the higher-order basis functions employed in WIPL-D.

Error Bound Due to the Random Position Errors in Adaptive Processing Using a Nonuniformly Spaced Array

Hwang, S., "Error bound due to the random position errors in adaptive processing using a Nonuniformly Spaced Array", Proc. of ACES Int Symp. (CD ROM Edition: S17P03.pdf), Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: In this paper, the gain power error bound due to random position errors in the array elements is presented. From the gain power error bound, the relationship between the output signal to interference and noise ratio (OSINR) and the coefficient of variation of the powerdensity function is investigated by adaptive processing using a single snapshot of the measured voltage at the feed points of a semi-circular antenna (SCA) elements in an array.

Calculated and Measured Absorption Cross Sections of Lossy Objects in Reverberation Chamber

Carlberg, U., Kildal, P-S., Wolfgang, A., Sotoudeh, O., and Orlenius, C., "Calculated and measured absorption cross sections of lossy objects in reverberation chamber", IEEE Trans. on Electromagnetic Compatibility, vol. 46, no. 2, pp. 146 – 154, May 2004

Link to Publication

Abstract: Reverberation chambers can be used to measure radiation efficiency of small antennas when these are located close to lossy objects. The lossy objects represent a heavy loading of the chamber. This loading is characterized by the mean absorption cross section of the lossy objects. This paper describes how this mean absorption cross section can be calculated from the scattered far field of an object by using the forward scattering theorem, or from a more laborious near-field evaluation. Results for lossy spheres and cylinders are calculated by using three different codes, based on spherical mode expansion, finite difference time domain techniques, and moment methods, respectively. The results for the cylinder are compared with measured levels in a reverberation chamber.

Numerical Modeling for Direction Finding Applications

Lysiak, K.A., "Numerical modeling for direction finding applications", Proc. IEEE AP-S Int. Symp., vol.3, pp. 2875 – 2878, (CD ROM Edition: s102p02a.pdf), Monterey, 20-25 June 2004

Link to Publication

Abstract: The Numerical Electromagnetic Code (NEC) has proven to be an excellent tool for the design and evaluation of complex direction finding (DF) antenna systems. Research at Southwest Research Institute (SwRI®) has focused for many years on the installation of distributed DF arrays on cluttered platforms in which the platform becomes an integral part of the DF array. For the past 8 years, SwRI has developed a concentrated research program in the use of numerical models for these applications, in particular HF DF on large naval ships. A logical choice for this application was NEC. In particular, research has been conducted in the following areas: 1) the ability of numerical models to predict basic DF array characteristics such as array response beamwidth and sidelobe levels; 2) the comparison of complex numerical responses to real world measurements; 3) techniques to evaluate numerical model accuracies; 4) the use of numerical models to develop DF algorithms; 5) the use of numerical models to reduce data collection; 6) optimization of DF antenna elements, their placement and their array geometry.

Radar-Based Microwave Imaging for Breast Cancer Detection: Tumor Sensing with Cross-Polarized Reflections

Yun, X., Johnston, R.H., and Fear, E.C., "Radar-based microwave imaging for breast cancer detection: tumor sensing with cross-polarized reflections", Proc. IEEE AP-S Int. Symp., vol. 3, pp. 2432 – 2435, (CD ROM Edition: s088p01j.pdf), Monterey, 20-25 June 2004

Link to Publication

Abstract: Microwave imaging for breast cancer detection is based on the difference in electrical properties of normal, fatty breast tissues and tumors. Tumors may be detected by observing variations in microwave signals transmitted through or reflected from the breast. Radar-based breast imaging methods use the reflected signals from the breast to form images, and generally this involves co-polarized reflections. Observation of the cross-polarized reflection was proposed in S.C. Hagness et al. (IEEE Transac. Ant. Propag., pp. 783-791, 1999), and it was shown that the cross-polarized response did not contain reflections from planar interfaces such as the chest wall. In this paper, we further explore the application of cross-polarization to tumor detection. A broadband antenna capable of detecting cross-polarized reflections is simulated, constructed, and measured. The feasibility of tumor detection with cross-polarized reflections is examined through simulations and experimentally

Calculation of the Near-Field from Axial Symmetric Apertures Using Gaussian-Like Discretization of the Aperture Field

Costa, J.R. and Fernandes, C.A., "Calculation of the near-field from axial symmetric apertures using Gaussian-like discretization of the aperture field", Proc. IEEE AP-S Int. Symp., vol. 2, pp. 1343 – 1346, (CD ROM Edition: s053p03j.pdf), Monterey, 20-25 June 2004

Link to Publication

Abstract: A Gabor variant is presented to determine the near-field from axial symmetric feeds with ϕ-independent fields. This method can be used for the analysis of small shaped dielectric lens antennas, when the classical geometric optics based approach fails.

A Compact Ultra Wide Impedance Bandwidth Antenna

Johnston, R.H., Choi, T.C., and Tung, E., "A compact ultra wide impedance bandwidth antenna", Proc. IEEE AP-S Int. Symp., vol. 2, pp. 1863 – 1866, (CD ROM Edition: s073p02a.pdf), Monterey, 20-25 June 2004

Link to Publication

Abstract: This paper describes an electric dipole and a magnetic dipole (slot antenna) which are connected in parallel to achieve an ultra wide impedance bandwidth antenna. This makes it suitable for application to ultra wideband communications systems and to communication systems that cover a number of distinct and wide spread frequency bands. The upper frequency limit of the antenna has not been investigated but it is expected to depend mostly on the fine structure of the feedpoint of the antenna

Stacked Elliptical Dielectric Resonator Antennas for Wideband Applications

Sharkawy, M.A., Elsherbeni, A.Z., and Smith, C.E., "Stacked elliptical dielectric resonator antennas for wideband applications", Proc. IEEE AP-S Int. Symp., vol. 2, pp. 1371 – 1374, (CD ROM Edition: s054p07a.pdf), Monterey, 20-25 June 2004

Link to Publication

Abstract: The work presents an improvement in the bandwidth of the dielectric resonator antenna (DRA) using a stacked elliptical DRA configuration placed above an infinite ground plane. The feed is a coaxial probe, providing proper wideband matching. The input impedance, the return loss and the radiation pattern were computed using the software package WIPL-D. Parametric studies were investigated for assessment of the antenna performance, resulting in an improved bandwidth of 61.5% (8 GHz) based on a -10 dB return loss for a 50 Ω-transmission line.

A Parametric Study of Band-Notched UWB Planar Monopole Antennas

Kerkhoff, A. and Ling, H., "A parametric study of band-notched UWB planar monopole antennas", Proc. IEEE AP-S Int. Symp., vol. 2, pp. 1768 – 1771, (CD ROM Edition: s068p06a.pdf), Monterey, 20-25 June 2004

Link to Publication

Abstract: Due to the collocation of the UWB frequency band with frequency bands reserved for narrowband wireless technologies, there is a need in the UWB device to provide filtering in those bands to avoid interference from, or causing interference to, narrowband devices. In this paper, a parametric study of a planar monopole antenna with a simple etched band-notching feature is presented. Results obtained using numerical simulation are presented which demonstrate the degree to which notch bandwidth can be varied and good wideband performance can be maintained with this antenna.

A Wide-Band Small Size Microstrip Antenna Proximately Coupled to a Hook Shape Probe

Kishk, A. A., Lee K-F., Mok, W.C., and Luk K-M., "A wide-band small size microstrip antenna proximately coupled to a hook shape probe", IEEE Trans. on Antennas and Propagat., vol. 52, no. 1, pp. 59 – 65, Jan. 2004

Link to Publication

Abstract: A rectangular shorted patch is designed to achieve a wideband performance and size reduction. The patch size is reduced to 25% of the full size patch with over 30% matching bandwidth. A hook shape probe excites the patch approximately. The effect of hook parameters is investigated. A comparison between the L-shape and the hook-shape probe is given. Some of the numerical results are verified experimentally. A 16 elements array is analyzed with different feeding arrangements indicating an improvement of the array performance.

Radar-Based Microwave Imaging for Breast Cancer Detection: Tumor Sensing with Cross-Polarized Reflections

Yun, X., Johnston, R.H., and Fear, E.C., "Radar-based microwave imaging for breast cancer detection: tumor sensing with cross-polarized reflections", Proc. IEEE AP-S Int. Symp., (CD ROM Edition: s088p01j.pdf), Monterey, 20-25 June 2004

Link to Publication

Abstract: Microwave imaging for breast cancer detection is based on the difference in electrical properties of normal, fatty breast tissues and tumors. Tumors may be detected by observing variations in microwave signals transmitted through or reflected from the breast. Radar-based breast imaging methods use the reflected signals from the breast to form images, and generally this involves co-polarized reflections. Observation of the cross-polarized reflection was proposed in S.C. Hagness et al. (IEEE Transac. Ant. Propag., pp. 783-791, 1999), and it was shown that the cross-polarized response did not contain reflections from planar interfaces such as the chest wall. In this paper, we further explore the application of cross-polarization to tumor detection. A broadband antenna capable of detecting cross-polarized reflections is simulated, constructed, and measured. The feasibility of tumor detection with cross-polarized reflections is examined through simulations and experimentally.

A Novel Low-Profile Log-Periodic Ultra Wideband Feed for the Dual-Reflector Antenna of US-SKA

Olsson, R., Kildal, P-S., and Weinreb, S., "A novel low-profile log-periodic ultra wideband feed for the dual-reflector antenna of US-SKA", Proc. IEEE AP-S Int. Symp., (CD ROM Edition: s105p09a.pdf), Monterey, 20-25 June 2004

Link to Publication

Abstract: We present a novel low-profile log-periodic ultra wideband (UWB) dipole antenna referred to as the Chalmers feed. The simulated results presented show that the antenna has low input reflection coefficient, low cross-polarization, constant beam width and constant phase center position over more than a decade bandwidth. The antenna can be enclosed in a volume of 0.5λL, · 0.5λL · 0.15λL size, where λL is the wavelength at the lowest frequency. The ground plane needs to be somewhat larger. The antenna is intended to feed a dual-reflector antenna proposed by the US-SKA consortium.

Transmission and Reception by UWB Antennas in Time Domain

Ghosh, D. and Sarkar, T.K., "Transmission and reception by UWB antennas in time domain", Proc. IEEE AP-S Int. Symp., (CD ROM Edition: s114p04u.pdf), Monterey, 20-25 June 2004

Link to Publication

Abstract: -

Antenna Pattern Synthesis in Operational Environments with Electromagnetic Compatibility-Based Constraints

Allen, O. E. and Wasylkiwskyj, W., "Antenna pattern synthesis in operational environments with electromagnetic compatibility-based constraints", IEEE Trans. on Electromag.Compat., Vol. 46, No. 4, pp. 668-674, Nov. 2004

Link to Publication

Abstract: A general linear least squares synthesis technique for antenna arrays is presented that takes account of mutual coupling among array elements and interactions with array's physical surroundings. The technique can be applied to optimize the radiation pattern of arbitrary arrays in their operational environment while simultaneously addressing electromagnetic compatibility based constraints. Examples employing the wire and plate-dielectric (WIPL-D) numerical code are presented to illustrate the approach. Use of this technique with experimental data has also been performed and will be reported in future paper.

A Wide-Band Small Size Microstrip Antenna Proximately Coupled to a Hook Shape Probe

Kishk, A. A., Lee K-F., Mok, W.C., and Luk K-M., "A wide-band small size microstrip antenna proximately coupled to a hook shape probe", IEEE Trans. on Antennas and Propagat., vol. 52, no. 1, pp. 59 – 65, Jan. 2004

Link to Publication

Abstract: A rectangular shorted patch is designed to achieve a wideband performance and size reduction. The patch size is reduced to 25% of the full size patch with over 30% matching bandwidth. A hook shape probe excites the patch approximately. The effect of hook parameters is investigated. A comparison between the L-shape and the hook-shape probe is given. Some of the numerical results are verified experimentally. A 16 elements array is analyzed with different feeding arrangements indicating an improvement of the array performance

Modeling the New Arecibo Dual Band High Frequency (HF) Facility

Turner, J. S. and Breakall, J. K., "Modeling the new arecibo dual band high frequency (HF) facility", Proc. of ACES Int Symp, CD ROM Edition: S01P02.pdf, Syracuse, 19-23 Apr. 2004

Link to Publication

Abstract: The use of a High Frequency (HF) Facility at Arecibo is essential for understanding the interaction between powerful HF radio waves and ionospheric plasma. In September 1998, Hurricane Georges destroyed the Islote Heating Facility which was located northeast of the Observatory. Reconstruction of the Isolate Facility is not feasible due to government regulations and other factors. A new HF facility that uses the 305 meter main dish of the Arecibo Observatory as a reflector is proposed.

2003

Numerical Analysis of Inverted-F antenna on Side of Small Rectangular Conducting Plate in Vicinity of B5-Sized Conducting Plate

Taguchi, M., Yanagisako, Y., Tanaka, K., "Numerical analysis of inverted-F antenna on side of small rectangular conducting plate in vicinity of B5-sized conducting plate ", Proc. of the 19th Applied Computational Electromagnetics Conf., Monterey, 24-28 March 2003

Link to Publication

Abstract: The inverted-F antenna on side of rectangular conducting plate of 182mm by 18mm is analyzed by using WIPL-D and IE3D based on the method of moment. This antenna is located in the vicinity of the B5-sized conducting plate. The numerical results by both simulators are compared.

Antenna Modeling and Analysis Using WIPL-D

Tabet, S., "Antenna Modeling and Analysis Using WIPL-D", Proc. of the 19th Applied Computational Electromagnetics Conf., Monterey, 24-28 March 2003

Link to Publication

Abstract: -

EM Modeling of Surfaces with STOP or GO Characteristics - Artificial Magnetic Conductors and Soft and Hard Surfaces

Kildal, P.S., Kishk, A.A., "EM modeling of surfaces with STOP or GO characteristics - artificial magnetic conductors and soft and hard surfaces", Proc. of the 19th Applied Computational Electromagnetics Conf., Monterey, 24-28 March 2003

Link to Publication

Abstract: We discuss and demonstrate by measurements and computations the relation between electromagnetic bandgap surfaces (EBG) used to realize artificial magnetic conductors and the so-called soft and hard surfaces in electromagnetics, with respect to their STOP and GO characteristics for surface waves. We show how the main characteristics of such surfaces can be modeled by using ideal surfaces representing perfect magnetic conductors (PMC) and PEC/PMC strip grids. Unfortunately, commercial codes do not allow such modeling for general shapes of the surfaces.

DOA Estimation Utilizing Directive Elements on a Conformal Surface

Kim, K., Sarkar, T.K., Wicks, M.C., Recio, R.F., Palma, M.S., "DOA estimation utilizing directive elements on a conformal surface", Proc. of the 2003 IEEE Radar Conference, pp. 91 – 96, 5-8 May 2003

Link to Publication

Abstract: In this paper we present a methodology on how to use directive elements in an adaptive array methodology. Typically one uses isotropic elements having practically no gain then the signal level is increased by putting hundreds and thousands of these elements together. In this paper we demonstrate a methodology where the elements can be arbitrarily spaced and may even be non-planar. In addition it is shown how to deal with nonuniformly spaced and non-planar arrays. We illustrate these principles in a direction of arrival (DOA) estimation utilizing directive elements.

FOPEN Scene Generation Using Numerical Electromagnetic Analysis

Simcoe, M., Chen, E., Adve, R., Qureshi, F., Schneible, J., Wicks, M., "FOPEN scene generation using numerical electromagnetic analysis", Proc. of the 2003 IEEE Radar Conference, pp. 362 – 369, 5-8 May 2003

Link to Publication

Abstract: This work develops the high-fidelity simulation capability for foliage penetration (FOPEN) synthetic aperture radar (SAR). The simulation is based on a method of moments (MOM) numerical electromagnetic analysis of target scenes including foliage. The ability to accurately model the interaction of foliage and target is crucial for an accurate simulation. Example scenes for isolated metal targets are provided in addition to scenes with dielectric and combined metal and dielectric targets. As expected, the effect of the surrounding foliage is shown to have a significant impact on the reconstructed target image. This approach will be useful in FOPEN applications for the prediction of target signatures under various conditions of concealment.

A Survey of Various Propagation Models for Mobile Communication

Sarkar, T.K., Ji Z.,Kyungjung K., Medouri, A., Salazar-Palma, M., "A survey of various propagation models for mobile communication", IEEE Antennas and Propagation Magazine, vol. 45, no. 3, pp. 51 – 82, June 2003

Link to Publication

Abstract: In order to estimate the signal parameters accurately for mobile systems, it is necessary to estimate a system's propagation characteristics through a medium. Propagation analysis provides a good initial estimate of the signal characteristics. The ability to accurately predict radio-propagation behavior for wireless personal communication systems, such as cellular mobile radio, is becoming crucial to system design. Since site measurements are costly, propagation models have been developed as a suitable, low-cost, and convenient alternative. Channel modeling is required to predict path, loss and to characterize the impulse response of the propagating channel. The path loss is associated with the design of base stations, as this tells us how much a transmitter needs to radiate to service a given region. Channel characterization, on the other hand, deals with the fidelity of the received signals, and has to do with the nature of the waveform received at a receiver. The objective here is to design a suitable receiver that will receive the transmitted signal, distorted due to the multipath and dispersion effects of the channel, and that will decode the transmitted signal. An understanding of the various propagation models can actually address both problems. This paper begins with a review of the information available on the various propagation models for both indoor and outdoor environments. The existing models can be classified into two major classes: statistical models and site-specific models. The main characteristics of the radio channel - such as path loss, fading, and time-delay spread - are discussed. Currently, a third alternative, which includes many new numerical methods, is being introduced to propagation prediction. The advantages and disadvantages of some of these methods are summarized. In addition, an impulse-response characterization for the propagation path is also presented, including models for small-scale fading, Finally, it is shown that when two-way communication ports can be defined for a mobile system, it is possible to use reciprocity to focus the energy along the direction of an intended user without any explicit knowledge of the electromagnetic environment in which the system is operating, or knowledge of the spatial locations of the tr- ansmitter and the receiver.

Characterization of Lossy Cylinder in Reverberation Chamber by Computed and Measured Absorption Cross Sections

Carlberg, U., Kildal, P-S., Wolfgang, A., Sotoudeh, O., Orlenius, C., "Characterization of lossy cylinder in reverberation chamber by computed and measured absorption cross sections", Proc. IEEE AP-S Int. Symp., vol. 4, pp. 719 – 722, Columbus, 22-27 June 2003

Link to Publication

Abstract: Recently it has been shown that reverberation chambers can be used to measure radiation efficiency and input impedance of small antennas. In particular, the it can be used to measure these characteristics for small antennas located close to lossy objects, such as a mobile phone antenna located in different positions relative to a head phantom filled with a brain tissue equivalent liquid. The present paper presents calculated and measured results for a lossy cylinder. The cylinder is filled with a brain tissue equivalent liquid of the type used in head phantoms when measuring specific absorption rate (SAR). We get the mean absorption cross section of the cylinder from measured average power levels in the reverberation chamber by using Hill's formulas, and these are compared with the computed results.

Study of Efficiencies and Phase Centers of Broadband Log-Periodic Feeds for Large Offset Dual-Reflector Antennas Using Formulas for Bodies of Revolution (BOR/sub 1/ extraction)

Ericsson, D., Kildal, P-S., Weinreb, S., "Study of efficiencies and phase centers of broadband log-periodic feeds for large offset dual-reflector antennas using formulas for bodies of revolution (BOR/sub 1/ extraction)", Proc. IEEE AP-S Int. Symp., vol. 1, pp. 241 -244, Columbus, 22-27 June 2003

Link to Publication

Abstract: The Allen Telescope Array (ATA) is a new instrument being built by the SETI institute. It is an array of offset Gregorian reflector antennas with a very large bandwidth, covering 0.5 GHz to 11 GHz. The feed consists of four log-periodic arms, together forming a pyramid. In the center of the pyramid, a metallic pyramid is located, holding low noise amplifiers and cryogenics. We present a method for analyzing dual reflector systems based on BOR1-extraction and use it to analyze the performance of the ATA feed in the offset Gregorian dual reflector. With a good corrugated feed in a paraboloid or Cassegrain antenna, the spillover efficiency is typically around -0.5 dB for the subtended angle giving the highest efficiency. The spillover efficiency for the ATA feed is around -1 dB, which is caused by high sidelobes. In order to increase the performance of the system, the sidelobes should be reduced. We have found that 0.5 dB gain can be accomplished by changing the shape of the ground pyramid in the center of the feed to a cone. This reduces the spillover and increases the BOR1 efficiency. With optimized placement of the feed in the reflector, the reduction of phase efficiency due to phase center movement is better than -1 dB. Considering the bandwidth of the feed, this is very good.

Electromagnetic Scattering from BOR Objects Loaded with Periodic Conducting Narrow Strips Using Asymptotic Boundary Conditions

Kishk, A.A., "Electromagnetic scattering from BOR objects loaded with periodic conducting narrow strips using asymptotic boundary conditions", Proc. IEEE AP-S Int. Symp., vol. 1, pp. 661 – 664, Columbus, 22-27 June 2003

Link to Publication

Abstract: The asymptotic strip boundary conditions (ASBC) are used on bodies of revolution (BOR) objects loaded with periodic conducting strips with period P approaching zero. The strips are tangential to the surface and either in the circumferential direction or orthogonal to it. The ASBC method is verified by using it to obtain the scattering fields from objects and comparing them with those obtained using the exact boundary conditions.

Application of Rotated Sequential Feeding for Circular Polarisation Bandwith Enhancement of Planar with Single-FED DRA Elements

Kishk, A. A., "Application of rotated sequential feeding for circular palarisation bandwith enhancement of planar arrays with single-FED DRA elements", Proc. IEEE AP-S Int. Symp., Columbus, 22-27 June 2003

Link to Publication

Abstract: Different arrangements and excitations for the single-fed dielectric resonator antenna (DRA) elements are used in planar arrays to study their effect on the circular polarization bandwidth. The rotational sequential feeding is found to provide a broadside axial ratio that is frequency independent.

Characterization of Lossy Cylinder in Reverberation Chamber by Computed and Measured Absorption Cross Sections

Carlberg, U., Kildal, P-S., Wolfgang, A., Sotoudeh O., Orlenius C., "Characterization of lossy cylinder in reverberation chamber by computed and measured absorption cross sections", Proc. IEEE AP-S Int. Symp., Columbus, 22-27 June 2003

Link to Publication

Abstract: Recently it has been shown that reverberation chambers can be used to measure radiation efficiency and input impedance of small antennas. In particular, the it can be used to measure these characteristics for small antennas located close to lossy objects, such as a mobile phone antenna located in different positions relative to a head phantom filled with a brain tissue equivalent liquid. The present paper presents calculated and measured results for a lossy cylinder. The cylinder is filled with a brain tissue equivalent liquid of the type used in head phantoms when measuring specific absorption rate (SAR). We get

the mean absorption cross section of the cylinder from measured average power levels in the reverberation chamber by using Hill's formulas, and these are compared with the computed results.

Wide-Band Truncated Tetrahedron Dielectric Resonator Antenna Excited by a Coaxial Probe

Kishk, A.A., "Wide-band truncated tetrahedron dielectric resonator antenna excited by a coaxial probe", IEEE Trans. on Antennas and Propagat., vol. 51, no. 10, part 2, pp. 2913 – 2917, Oct. 2003

Link to Publication

Abstract: A truncated tetrahedron dielectric resonator antenna is examined numerically and experimentally. The tetrahedron base is an equilateral triangular over a ground plane and excited by a coaxial probe to provide a broad side radiation pattern. Three different configurations are analyzed: the truncated tetrahedron when the wide base is attached to the ground plane, the narrow base attached to the ground plane, and the equitriangular cylinder. Results are verified experimentally and numerically. The tetrahedron with narrow base attached to the ground plane achieves wide-band performance for the impedance match and the radiation patterns of about 40%.

Active inverted-F Antenna on Side of Small Conducting Plate. Part 2

Taguchi, M., Tanaka, K., "Active inverted-F antenna on side of small conducting plate. Part 2", IEEE Topical Conference on Wireless Communication Technology, pp. 344 – 345, 15-17 Oct. 2003

Link to Publication

Abstract: The digital terrestrial television broadcasting service will start soon in Japan. For the antenna of the portable TV, a small sized antenna is desired. The active inverted-F antenna (AIFA) printed on the finite PCB is calculated by using the electromagnetic simulator WIPL-D based on the method of moments. This simulator is capable of analyzing the antenna composed of metallic and or dielectric magnetic materials.

Efficiency of a Resistively Loaded Microstrip Patch Antenna

Hum, S.V., Chu, J.Z., Johnston, R.H., Okoniewski, M., "Efficiency of a resistively loaded microstrip patch antenna", Antennas and Wireless Propagation Letters, vol. 2, no. 1, pp. 22 – 25, 2003

Link to Publication

Abstract: Resistive loading has been proposed as a method for improving the bandwidth of planar antennas. The paper assesses the impact of resistive loading on the performance of a microstrip patch antenna. While resistively loaded antennas offer the benefit of large improvements in antenna bandwidth, it is illustrated through the use of theoretical developments, numerical simulations, and experiment, that the efficiency of some of the antennas reported in the literature is unacceptably low.

Electromagnetic modeling and analysis of wireless communication antennas

Hoorfar, A., Jamnejad, V., "Electromagnetic modeling and analysis of wireless communication antennas", IEEE Microwave Magazine, vol. 4, no.1, pp. 51 – 67, March 2003

Link to Publication

Abstract: The goal of this article is threefold: to present the basic principles of the application of method of moments (MoM), finite-difference time-domain (FDTD) and finite-element method (FEM) to analysis of antennas; to present examples of antenna simulations that show the capabilities of some modern commercially available simulators; to discuss future trends in modeling and analysis of microwave and millimeter-wave antennas for wireless communications.

Assessing the Effect of Finite Conductivity on the Performance of Microstrip-Fed Patch Antennas

Stewart, J. W., Wood, W. D., "Assessing the effect of finite conductivity on the performance of microstrip-fed patch antennas", Proc. of the 19th Applied Computational Electromagnetics Conf., Monterey, 24-28 March 2003

Link to Publication

Abstract: The effect of finite conductivity on the performance of microstrip-fed patch antennas is examined. A zinc oxide film conductive patch material is modelled as an equivalent resistive surface using WIPLD. The dielectric substrate and ground plane are finite in extent. The antenna radiation pattern and input impedance are used as figures of merit to assess different equivalent resistivities, corresponding to different thicknesses of the conductive zinc oxide layer. Results show that moderate thicknesses of zinc oxide are sufficient support acceptable patch antenna performance.

Parallel Scene Generation – Why Parallelize WIPL-DP?

Kohler, R., George, A., Sarkar, T., "Parallel scene generation – why parallelize WIPL-DP? ", Proc. of the 19th Applied Computational Electromagnetics Conf., Monterey, 24-28 March 2003

Link to Publication

Abstract: Electromagnetic analysis of large complex structures and structures in the environment requires massive processing memory and computational capability. The ever-increasing speed and memory size of today\'s computers is dwarfed by the need to solve complex problems. There exists a highly efficient commercial electromagnetic modeling tool called WIPL-D that partially addresses these problems. This paper will present a discussion of an effort that is currently underway to develop a parallelized WIPL-D that will expand the problem sizes that can currently be solved. The parallelized WIPL-D will provide exciting new design and research possibilities for electromagnetic analysis.

Single-Fed Circularly Polarized Dielectric Resonator Antenna

Kishk, A. A., "Single-fed circularly polarized dielectric resonator antenna ", Proc. of the 19th Applied Computational Electromagnetics Conf., Monterey, 24-28 March 2003

Link to Publication

Abstract: Attention to dielectric resonator antennas (DRA) has been increasing because of their small size, bandwidth, high radiation efficiency [1] and ease of excitation. Attention was also toward linearly polarized DRA [2-3] and wideband antennas [4-5]. Circularly polarized DRA has been studied experimentally in a sub-array environment. The circular polarization is excited by a cross-slot excitation [6-8] or by designing a crossed-shape dielectric resonator [7]. All these studies have been performed experimentally to excite two orthogonal modes with 90 degree phase shift between them. If single feed is required, a perturbation for the geometry can be used to achieve that. However, always such technique provides very small circular polarization bandwidth. If such antenna is used in a sub-array with a sequential feeding mechanism of each two elements or four elements sub-array a much wider bandwidth for the circular polarization can be achieved. Here, we design a circularly polarized elliptic dielectric resonator with single probe feeding. The probe position and parameters are used to match the antenna and to excite the circular polarizations. The analysis is performed numerically using WIPL-D [9].

WIPL-D Compared to Other EM Codes for the Analysis of printed Antennas

Peixeiro, C. O., Fernandes, C. A., "WIPL-D compared to other EM codes for the analysis of printed antennas", Proc. of the 19th Applied Computational Electromagnetics Conf., Monterey, 24-28 March 2003

Link to Publication

Abstract: This paper compares WIPL-D results with measurements and with two other known commercial EM codes for the analysis of selected configurations of printed antennas. Four examples are tested, ranging from the basic square patch to less trivial multilayer structures with thick substrates. Simulated radiation pattern and return loss results are compared with measured data, for proper assessment of the accuracy. The study also compares efficiency, flexibility and user friendliness. Rather than trying to rank the codes, the objective of the paper is to present and discuss results from systematic tests, and show strengths and trade-offs of the code.

2002

The design and Analysis of Miniaturized Planar Monopoles

Kerkhoff, A., Hao Ling, "The design and analysis of miniaturized planar monopoles", Proc. IEEE AP-S Int. Symp., vol. 4, pp. 30 – 33, San Antonio, 16-21 June 2002.

Link to Publication

Abstract: The design and analysis of miniaturized planar monopoles is presented for bow-tie and reverse bow-tie monopoles. A genetic algorithm (GA) approach is used to generate reduced size planar monopoles as small as 0.12λ. Through an analysis of the GA designs, design guidelines for antenna miniaturization are deduced. The resonant frequency of the antenna can be reduced by making the element edge more ragged, and further reduced by placing long notches along the sides of the element. These notches improve the impedance matching of small antennas by increasing the radiation resistance and adding inductive reactance to tune the antenna. These techniques do not significantly reduce the high radiation efficiency characteristic of the planar monopole. A numerical analysis comparing the NEC and WIPL-D simulation results to measurements shows that WIPL-D can predict the performance of the GA designs more accurately.

Balance Measurements in Double-Y Baluns

Jokanovic, B., Trifunovic, V., Reljic, B., "Balance measurements in double-Y baluns", IEEE Proceedings - Microwaves, Antennas and Propagation, vol. 149, no. 56, pp. 257 – 260, Oct.-Nov. 2002.

Link to Publication

Abstract: Amplitude and phase balances in a double-Y balun, which transforms a coplanar waveguide with finite ground plane (CPWFGP) into a coplanar line (CPS), are investigated theoretically and experimentally. Measured results are presented for two baluns with different lengths of open- and short-circuited stubs. The balun with longer stubs demonstrated better amplitude balance. In the frequency range 3 to 14 GHz the measured amplitude balance is better than 1 dB and the phase balance is better than 8°. At the frequencies where resonances of the parasitic even mode appear, the balun has poor characteristics.

FM Wide Band Panel Dipole Antenna

Trainotti, V., Dalmas Di Giovanni, N., "FM wide band panel dipole antenna", IEEE Transactions on Broadcasting, vol. 48, no. 4, pp. 317 – 323, Dec. 2002.

Link to Publication

Abstract: It is very common that when a broadcaster needs to install an FM transmitting antenna within a large metropolitan area he places it on the tallest structure or building available. When the rooftop is already occupied by a large number of other types of transmitting and receiving antennas, the panel dipole antenna should be chosen. This antenna is secured to the side walls of the upper floors with the panel oriented to obtain full coverage of the most desirable areas of the city. For the Buenos Aires area this orientation avoids radiating toward Uruguay and specifically toward Montevideo, some 140 miles away. A wide band antenna operation permits placing the station on the air and at the same time allows future stations to share it without the installation of new antennas. Details of model and full model impedance and radiation pattern measurements during the antenna development are presented in order to show its technical characteristics.

The radiation patterns were measured on a scale model in an anechoic chamber. The full scaled model was measured in an outdoor antenna range. Both E and H plane radiation patterns were measured along the FM band in order to observe pattern variations on both planes. Practically no difference in a panel radiation beamwidth from 88 to 108 MHz was observed and at the same time good input impedance was maintained. A really wide band antenna in pattern and VSWR is obtained. Power division for the antenna system is obtained designing an eight port power divider using the microstrip line technique. In this case, however due to high power operation the ground plane and strip are contained in a sealed metallic box and are separated by high pressure dry air like into the 3" feeding coaxial line.

Adaptive Processing Using a Single Snapshot for a Nonuniformly Spaced Array in the Presence of Mutual Coupling and Near-Field Scaterrers

Kyungjung, K., Sarkar, T.K., Palma, M.S., "Adaptive processing using a single snapshot for a nonuniformly spaced array in the presence of mutual coupling and near-field scatterers", IEEE Trans. on Antennas and Propagat., vol. 50, no. 5, pp. 582 – 590, May 2002.

Link to Publication

Abstract: This paper presents an adaptive technique to extract the signal of interest (SOI) arriving from a known direction in the presence of strong interferers using a single snapshot of data. The antenna elements in this method can be nonuniformly spaced and there can be mutual coupling between them. In addition, near-field scatterers can also be present. First, the voltages induced in the antenna elements of the array due to interferers, mutual coupling between the elements, and near-field scatterers is preprocessed by applying a transformation matrix to these voltages through a rigorous electromagnetic analysis tool. This electromagnetic preprocessing technique transforms the voltages that are induced in a nonuniformly spaced array containing real antenna elements to a set of voltages that will be produced in a uniform linear virtual array (ULVA) containing omnidirectional isotropic point radiators. In the transformation matrix we would like to include various electromagnetic effects like mutual coupling between the antenna elements, presence of near-field scatterers and the platform effects on which the antenna array is mounted. This transformation matrix when applied to the actual measured voltages yields an equivalent set of voltages that will be induced in the ULVA. A direct data domain least squares adaptive algorithm is then applied to the processed voltages to extract the SOI in the presence of interferers. Limited numerical examples are presented to illustrate the novelty of the proposed method

2001

Differential GPS Ground Reference Antenna for Aircraft Precision Approach Operations – WIPL Design

Lopez, A., "Differential GPS Ground Reference Antenna for Aircraft Precision Approach Operations – WIPL Design", Proc. of 17th Applied Computational Electro-magnetics Conf., Monterey, CA, pp. 254-260, March 2001

Link to Publication

Abstract: This paper describes the application of the WIPL code to the design of a Differential GPS ground reference antenna for aircraft precision approach operations. This antenna has unique requirements with respect to coverage of the upper hemisphere for the reception of circularly polarized transmissions from satellites, mitigation of multipath effects, and control of group-delay variations. The antenna is part of a ground-based subsystem intended to provide sub meter accuracy corrections to aircraft on final approach to a runway. For this application the WIPL code provided the means for designing a 21-element collinear array almost completely by computer simulation.

Commercial Antenna Designs Using WIPL-D Code

Seavey, J., "Commercial Antenna Designs Using WIPL-D Code", Proc. of 17th Applied Computational Electro-magnetics Conf., Monterey, CA, pp. 261-268, March 2001

Link to Publication

Abstract: This paper describes many successful antenna and microwave products that have been designed by a commercial antenna and microwave company over the past 5 years using the WIPL and WIPL-D codes.

Comparasion of Results for the NEC4, WIPL-D, and EIGER Antenna Modeling Programs

Stamm, J. and Breakall, J., "Comparasion of Results for the NEC4, WIPL-D, and EIGER Antenna Modeling Programs", Proc. of 17th Applied Computational Electro-magnetics Conf., Monterey, CA, pp. 269-276, March 2001

Link to Publication

Abstract: Results are obtained for various antenna test model cases using three independent moment method codes, NEC4, WIPL-D, and EIGER. NEC4 is the classic EFIE wire modeling program widely known and used for many years. WIPL-D (Wire/Plate) [1] is a relatively new program that has the ability to model wires (similar to NEC4), plates, and dielectric volumes simultaneously...

WIPL-D Compared With Theory and Experiment

Fernandes, C., Salema, C. and Silveirinha, M., "WIPL-D Compared With Theory and Experiment", Proc. of 17th Applied Computational Electro-magnetics Conf., Monterey, CA, pp. 277-284, March 2001

Link to Publication

Abstract: The commercially available 3-D electromagnetic solver WIPL-D is assessed by comparing its results with theoretical and experimental results obtained for practical applications. The examples correspond to

three different areas of electromagnetic analysis: antenna feeds, material characterization, and scattering by obstacles. The examples were picked for its particular sensitivity to computation accuracy. Results show an overall satisfactory agreement, with acceptable computation time even for large composite metal and dielectric structures.

Design and Analysis of Selected Antennas Using WIPL and WIPL-D

Johnston, R. and Okoniewski, M., "Design and Analysis of Selected Antennas Using WIPL and WIPL-D", Proc. of 17th Applied Computational Electro-magnetics Conf., Monterey, CA, pp. 285-292, March 2001

Link to Publication

Abstract: In this paper a number of antennas will be analyzed using early versions and the latest versions of WIPL. The Moment Method package known as WIPL has the provision for current flow in plates and wires of variable diameter. The employment of WIPL is recommended due to its applicability to a variety of antenna shapes, its accuracy, and its speed of calculation and for the insight that it can provide to the operation of any antenna. In the following paper three antennas and one wave-guide component are analyzed and the calculated results from WIPL are compared with experimental where it is available.

Use of the WIPL-D and NEC4 Modeling Codes in the Design of a Specialized HF Antenna Feed for the 305 Meter Arecibo Radio Telescope

Jacobs, M. and Breakall. J., "Use of the WIPL-D and NEC4 Modeling Codes in the Design of a Specialized HF antenna Feed for the 305 Meter Arecibo Radio Telescope", Proc. of 17th Applied Computational Electro-magnetics Conf., Monterey, CA, pp. 293-300, March 2001

Link to Publication

Abstract: The performance of a Yagi-Uda type feed antenna for the 305-meter spherical reflector atthe Arecibo Observatory is modeled and optimized using the WIPL-D [1] and NEC4Method of Moments codes. The Arecibo radio telescope has primarily been used for work above 50 MHz using large line feed antennas or point feed (horn or small dipoles)antennas and corrective optics to substantially eliminate the effects of sphericalaberration. Ionospheric modification experiments at HF frequencies below 10 MHz had been conducted at the observatory using a separate high-power transmitting antenna arrayat a geographically distant location. In this work, an attempt was made to integrate theHF antenna with the main observatory reflector. The reflector surface, ground screen,and the suspended steel platform, along with the candidate Yagi-Uda feed antennas weremodeled for both radiation and impedance performance. The NEC4 code modeled thereflector and all other structures using wires or as a wire grid, while the WIPL-D codeused conducting plates for the reflector, ground noise reduction screen, Gregorian opticsdome, and parts of the Yagi-Uda feed antenna, and wire segments for the remainder of the feed antenna and platform structure. Both codes were in substantial agreement andthe performance of the overall system at HF was found to meet

or exceed requirements.An additional concern with high E-field values near the transmitting antenna was studiedusing the WIPL-D program exclusively

Constant Flux Illumination of Square Cells for Millimeter-Wave Wireless Communications

Fernandes, C.A. and Anunciada, L.M., "Constant flux illumination of square cells for millimeter-wave wireless communications", IEEE Transactions on Microwave Theory and Techniques, vol. 49, no. 11, pp. 2137 – 2141, Nov. 2001

Link to Publication

Abstract: The use of highly shaped-beam base-station antennas in millimeter-wave wireless communication systems may contribute to significantly enhance system performance. Previously proposed axial symmetric dielectric lenses provide a most useful constant-flux circular footprint, but they may fail to cover the regions near the vertices of square or rectangular cells, unless excessive wall illumination is allowed. This paper presents a simplified procedure to design shaped three-dimensional dielectric lenses that produce constant-flux illumination with square or rectangular footprints, suitable for indoor cells. The procedure is based on circular symmetric dielectric-lens design formulation, yet very sharp rectangular-cell boundary is obtained. Calculated and measured antenna performance is presented, not only in terms of radiation pattern, but also in terms of coverage and time-dispersion characteristic. The procedure is demonstrated for a square-cell lens and is extended for the rectangular-cell case

1999

Comparison and Results for Models of a Thick Bent-Wire Dipole Using NEC4 and WIPL

Stamm, J., Fenton, M. and Breakall. K., "Comparison and Results for Models of a Thick Bent-Wire Dipole Using NEC4 and WIPL", Proc. of 17th Applied Computational Electro-magnetics Conf., Monterey, CA, March 1999

Link to Publication

Abstract: -

Shaped Dielectric Lenses for Wireless Millimeter-Wave Communications

Fernandes, C.A., "Shaped dielectric lenses for wireless millimeter-wave communications", IEEE Antennas and Propagation Magazine, vol. 41, no. 5, pp. 141 – 150, Oct. 1999

Link to Publication

Abstract: Dielectric-lens antennas are effective at producing highly shaped beams that can enhance the performance of wireless broadband communication systems. Beam shaping is used to reduce multipath

interference, which causes fading and decay spread, and to enhance gain, so that the received power level is compatible with the requirements of high-data-rate transmission. This paper presents an overview of the design and measured performance of some examples of dielectric lenses that can be used in typical scenarios of wireless broadband communication systems. The paper also addresses the radio coverage produced by these antennas. The lenses are based on a single basic configuration where the feed is embedded in the lens body. This antenna configuration is flexible enough to accommodate different target beam-shaping specifications

1998

Circularly Polarised Printed Antenna with Conical Beam

Nesic, A., Brankovic, V., and Radnovic, I., "Circularly polarised printed antenna with conical beam", Electronics Letters, vol. 34, no. 12, pp. 1165 – 1167, 11 June 1998

Link to Publication

Abstract: A new circularly polarised printed antenna concept with conical beam is presented. The proposed concept describes a simple printed structure with an omnidirectional pattern and maximum gain of ~6 dBi at elevation angles between 30° and 60°, with features suitable for various commercial applications. The voltage standing wave ratio is <1.3 and the axial ratio is <2 dB in the 3% operational bandwidth around 4.6 GHz. The experimental results show good agreement with those obtained by simulation

Compact Radiating Element

Strickland, P.C., "Compact radiating element", Electronics Letters, vol. 34, no. 13, pp. 1280 – 1282, 25 June 1998

Link to Publication

Abstract: A new, compact, low profile radiating element is described which has a number of interesting and useful characteristics that are not easily obtained from microstrip patches or other low profile radiators. The element, which is shaped like a small square metal cap, has a very compact footprint and a height of the order of one-eighth of a wavelength. Both circularly polarised and linearly polarised variants have been investigated, and a bandwidth in excess of 17% has been demonstrated

1996

Printed Antenna and Array with Circular Polarisation

Nesic, A., Radnovic, I., and Mikavica, M., "Printed antenna and array with circular polarisation", Electronics Letters, vol. 32, no. 9, pp. 785 – 786, 25 April 1996

Link to Publication

Abstract: A new type of printed antenna element, as well as an array of elements with circular polarisation, is shown. The antenna has a much wider bandwidth than known circularly polarised printed antennas, mostly microstrip patches. The method of design and realisation with experimental results is shown

Star Mixer with High Port-to-Port Isolation

Trifunovic, V. and Jokanovic, B., "Star mixer with high port-to-port isolation", Electronics Letters, vol. 32, no. 24, pp. 2251 – 2252, 21 Nov. 1996

Link to Publication

Abstract: The authors describe the realisation of a hybrid star mixer with enhanced port-to-port isolation, which uses novel double-Y baluns. The mixer has a minimum conversion loss of 5.5 dB and has >1.5 GHz IF bandwidth and 6.5 GHz LO/RF bandwidth for a conversion loss of <9 dB. LO/RF isolation is better than 30 dB and LO/IF isolation is better than 25 dB in the 5-10 GHz range