

# ACES

The Applied Computational Electromagnetics Society

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## NEWSLETTER

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### Editor's note:



Hello again, In this brief end-of-the-year Newsletter, I would like you to invite you to join me by contributing to the Newsletter in 2011.

I would also like to remind you about membership and the forthcoming conference.

You might (or might not) be interested in my ramblings about snow and EM propagation (based on the fact that we have had a few inches of Snow in the UK and the country is struggling)

For those of you taking a holiday now, happy holidays, merry Christmas and a happy New Year. I hope 2011 brings you good health, interesting work and a lot of laughs.

Wishing you all well

Alistair Duffy [apd@dmu.ac.uk](mailto:apd@dmu.ac.uk)

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## Call to ACES

I am sure that many of you will have now received and paid your membership dues for 2011. If not, please don't forget. If you haven't regularly dipped in to the Journal as part of your membership benefit, please do have a look. The frequency has increased and the quality of papers is superb. Why not get a friend to join as well? In fact, why not bring a friend to the conference as well?

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On to the Newsletter... I would like to invite you to get involved with the Newsletter. I feel that this is a good focal point for the ACES community and would it to reach out. Please get in touch if you might be interested in contributing regular material or just one-off pieces. Some ideas to think about:

- Tutorials
- Reviews of techniques or topic areas
- Introductions to the work of your organisation/laboratory/group
- Book reviews
- Summaries of recent articles on particular topics
- Opinion pieces
- Educators' good practice (such as novel or particularly clear ways to describe theory, experiments, etc.)
- Software reviews (particularly free-ware)
- Personality profiles
- What's on
- Technology watch

Please email me if you would like to get involved.

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## Let it snow

Please excuse this very UK-centric diversion but while some of you are basking in glorious weather or are coping with at least a foot of snow without thinking about it, some of us in Western Europe have been struggling with a few inches of snow. This has caused wide-spread chaos. As it does in the UK every time it snows, in fairness. However, I started to wonder what work has been done involving propagation and snow and came across a few interesting abstracts. This is not a fully scientific study (in fact it is not a scientific study at all but a search for some abstracts that sounded interesting to me). I have not fully reviewed the papers but I thought that you might be interested or may even have some more topical suggestions to make.

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I keep saying that electromagnetics is at the core of pretty much everything around us, one way or another, and this shows that even bad weather is good material for research in electromagnetics.

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There's a PhD from the University of Michigan by DaHan Liao, "Physics-Based Near-Earth Radiowave Propagation Modeling and Simulation", 2009. <http://hdl.handle.net/2027.42/62371>

*Both the efficacy and accuracy of existing algorithms for predicting radiowave coverage are often compromised for the region proximate to the ground surface where grazing incidence (and wave cancellation) occurs, surface wave propagation predominates, and intricate higher order reflection and diffraction phenomena become important. A challenge of ongoing interest is to develop high-fidelity electromagnetic models that can reliably evaluate wave interaction with a realistic terrain over long distances with the inclusion of ground proximity effects—in order to support channel performance assessment and grid planning of near-ground (or even sub-surface) communication systems and sensing-oriented networks. In the featured study, physics-based propagation models enabling accurate calculation of propagation path-loss among the nodes of the VHF (30 MHz – 300 MHz) near-earth wireless system deployed in natural scenes are assembled through a compilation of analytical,*

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*numerical, experimental, and hybrid approaches. Wave propagation issues and their physical interpretations pertinent to the modeling of assorted terrain conditions are presented within the scope of the following: (1) Demonstration of the relevancy and significance of various types of surface waves defining near-grazing radiowave interactions with a dielectrically-covered terrain through the derivation of second order asymptotic solutions. (2) Treatment of the diffraction effect of a vegetation layer discontinuity using Kirchhoff-Huygens approach and validation of obtained results with measurements from an experimental setup. (3) Simulation of long-distance propagation over undulating terrain surfaces with a high order numerical solver achieving accurate solutions with as few as one unknown per linear wavelength for highly rough profiles (rms slope up to 15°). (4) Characterization of ground wave propagation over random rough surfaces with closed-form effective, near-grazing reflection coefficients formulated from an existing volumetric polarization current-based perturbation approach. (5) Performance analysis and comparison of low-profile, near-ground radiating structures with a hybrid modeling technique.*

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An interesting paper that generalizes a two layered Earth model is by Theofilos A. Papadopoulos, Grigoris K. Papagiannis, and Dimitrios A. Labridis, **Wave Propagation Characteristics of Overhead Conductors Above Imperfect Stratified Earth for a Wide Frequency Range** in IEEE Trans Magnetics **45**(3) 2009, pp 1064 - 1067

*“The influence of stratified earth on the wave propagation characteristics of overhead conductors is analyzed, using a generalized twolayer earth model of varying electromagnetic characteristics. A systematic comparison to simpler stratified earth models is presented, showing the differences in the propagation characteristics.”*

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Perhaps we could look at something with a more military bias and consider the paper by Joel P. Booth, Sonya Read, Barry Allen, **Weather and Propagation Effects on Multi-Mode Seeker Systems**, In the 2009 IEEE Aerospace Conference, March 2009

*This paper will discuss the progression of army seeker systems from a single mode to a multi-mode configuration. This progression is in part due to the effects of weather on*

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*seeker system performance. This discussion will be based on computer simulations and climatological data and test data. The relationships between frequency and range will be explored as they interact with the weather. This effort is being conducted in the RF Technology Function of the Applied Sensors, Guidance, and Electronics Division, U.S. Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC) on the Redstone Arsenal in Huntsville, Alabama.*

*While there is extensive work in this area, which is represented here in a condensed form, this paper will go into greater detail of the attenuation due to rainfall rates and cloud water content. The ground work for this effort was described in a paper "Weather and Radar Interactions. This research is a continuation of that work. The goal is to update the current trend in seeker development. The data obtained from this effort will be used to support the selection of new seeker system parameters. The effects of the weather would impact the selection of operating frequency and modes.*

*This paper will also present some of the early test bed results of multimode seeker trials.*

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While there work is more empirical, free space optics results in an interesting paper from the universities of Graz, Budapest and Lahore. By Muhammad Saleem Awan, Laszlo Csurgai Horwath, Sajid Sheikh Muhammad, Erich Leitgeb, Farukh Nadeem, Muhammad Saeed Khan, which I think has some interesting potential for propagation modelling. **Characterization of Fog and Snow Attenuations for Free-Space Optical Propagation** In the Journal of Communications, Vol 4(8), pp533 – 545

*Free Space Optics (FSO) is now a well established access technology, better known for its robustness in transmitting large data volumes in an energy efficient manner. However the BER performance of a FSO ground-link is adversely affected by cloud coverage, harsh weather conditions, and atmospheric turbulence. Fog, clouds and dry snow play a detrimental role by attenuating optical energy transmitted in terrestrial free-space and thus decrease the link availability and reliability. We measured the time variation of received optical signal level during continental fog and dry snowfall over a link distance of 80 m. We perform a detailed analysis of the continental fog and dry snow attenuation results and further characterise them by presenting some useful attenuation statistics and also showing their comparison with*

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*the corresponding measured density values collected by a particle sensor device. We propose also an empirical relationship between temperature, relative humidity and optical attenuation values for the continental fog case based on standard curve fitting technique.*

If normal communications channels suffer because of snow, how much worse would it be for moisture in the terahertz region? The paper “**Channel Capacity of Electromagnetic Nanonetworks in the Terahertz Bandby**” Josep Miquel Jornet and Ian F. Akyildiz looks at this. It was published in the IEEE Int Conf on Communications in May 2010.

Nanotechnology is enabling the development of devices in a scale ranging from one to a few hundred nanometers. Coordination and information sharing among these nano-devices will lead towards the development of future nanonetworks, rising new applications of nanotechnology in the medical, environmental and military fields. Despite the major progress in nano-device design and fabrication, it is still not clear how these atomically precise machines will communicate. The latest advancements in graphene- based electronics have opened the door to electromagnetic communication among nano-devices in the terahertz band (0.1-10 THz). This frequency band can potentially provide very large bandwidths, ranging from the entire band to several gigahertz- wide windows, depending on the transmission distance and the molecular composition of the channel. In this paper, the capacity of the terahertz channel is numerically evaluated by using a new terahertz propagation model, for different channel molecular compositions, and under different power allocation schemes. A novel communication technique based on the transmission of ultra-short pulses, less than one picosecond long, is motivated and quantitatively compared to the capacity- optimal power allocation scheme. The results show that for the very short range, up to a few tens of millimeters, the transmission of short pulses offer a realistic and still efficient way to exploit the terahertz channel.

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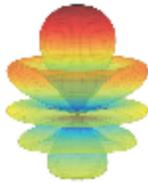
I hope you found some of those abstracts interesting. I will think about my holdups on the way into work slightly differently now this winter.

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## **Conference**

Don't forget that this years conference is already shaping up to be an excellent event. The CFP is next.

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# ACES

## Applied Computational Electromagnetics Society

ACES Web Site: <http://aces.ee.olemiss.edu>

### CALL FOR PAPERS



### The 27<sup>th</sup> International Review of Progress in Applied Computational Electromagnetics March 27-31, 2011, Williamsburg, Virginia

The international ACES symposium serves as a forum for developers, analysts, and users of computational techniques applied to electromagnetic field problems for all frequency ranges. The symposium includes technical invited plenary and regular presentations, software demonstrations, vendor booths, and short courses.

Papers may address general issues in applied computational electromagnetic or focus on specific applications, techniques, codes, or computational issues of potential interest to the Applied Computational Electromagnetics Society (ACES) membership. The following is a list of suggested topics, although contributions in other areas of computational electromagnetics will be considered.

#### Computational Methods:

- Integral Equation
- Differential Equation
- Hybrid and Multi-Physics
- Low Frequency
- Asymptotic and High Frequency
- Fast and Efficient

#### EM Applications:

- RFID Systems
- Nanotechnology
- MEMS and MMIC
- Bio-Electromagnetics
- Remote Sensing
- Inverse Scattering
- Propagation Analysis

#### High Performance Computing:

- Parallel and GPU Computations
- Optimization Techniques

#### EM Modeling:

- Antenna Arrays
- Small Antennas
- TeraHertz Antennas
- Dielectric Resonator Antennas
- Printed and Conformal Antennas
- Wideband and Multiband Antennas
- Electrically Large Structures
- Guided Structures
- EBG and Frequency Selective Surfaces
- Metamaterial and Artificial Materials

Authors of accepted papers will have the option to submit an extended version of their paper or papers for review and publication in a special issue of ACES Journal.

*\*\*Photo courtesy of The Colonial Williamsburg Foundation, Williamsburg, VA.*

*\*\*Applied Computational Electromagnetics Society (ACES) is not affiliated with Colonial Williamsburg Company or The Colonial Williamsburg Foundation.*

### SYMPOSIUM STRUCTURE

The international annual ACES Symposium traditionally includes: oral sessions, regular and invited, poster sessions, a student paper competition, short courses, software demonstration, an awards banquet, vendor exhibits, and social events. The ACES Symposium also includes plenary and panel sessions, where invited speakers deliver original essay-like reviews of hot topics of interest to the computational electromagnetics community.

### PAPER FORMATTING REQUIREMENTS

The recommended paper length is four (4) pages, with six (6) pages as a maximum. Submitted papers should be formatted for printing on 8.5x11-inch US standard paper, and should strictly follow the conference paper template posted on ACES site.

### PAPER SUBMISSION PROCEDURE

No email, fax or hard-copy paper submission will be accepted. Papers are required in Adobe Acrobat format (\*.PDF) and must be submitted through the conference section on ACES web site. Successful submission will be acknowledged by email after completing the uploading procedure on ACES web site.

### SUBMISSION DEADLINE AND REGISTRATION REQUIREMENT

Submission deadline is **October 15, 2010**. Upon the completion of the review process, the decision notification along with the pre-registration information will be emailed to the corresponding author on or about **December 15, 2010**. Corresponding author takes the responsibility to inform all other co-authors about the status of the paper. Each presenting author is required to complete the paid pre-registration and the execution of any required paper corrections by the firm deadline of **January 15, 2011** for final acceptance for presentation and inclusion in the symposium CD proceedings. Only two accepted papers can be associated with one conference registration.

### STUDENT PAPERS CONTEST

Members of the ACES student paper competition committee selects the top ten (10) student papers submitted for presentation at a special session. Those ten students will be granted free conference registration. Additionally, the best three (3) student papers presented at the 27<sup>th</sup> ACES Annual Review will be announced at the symposium banquet. The first, second, and third winners will be awarded cash prizes of \$300, \$200, and \$100, respectively.

General Chairs	Technical Program Chair	Short Course Chair	Exhibits Chair	Publicity Chairs
<i>C. J. Reddy</i> EM Software & Systems	<i>Atef Elsherbeni</i> The University of Mississippi	<i>Kubilay Sertel</i> Ohio State University	<i>Andrew L. Drozd</i> ANDRO Computational Solutions	<i>Osama Mohammed</i> Florida International University
<i>Erik Vedeler</i> NASA Langley Research Center				<i>William Coburn</i> Army Research Laboratory

For more information, please visit ACES on-line at: <http://aces.ee.olemiss.edu>.

<b>Committee information</b>	If you are interested in the work of any of these committees, please contact the committee Chairs directly.	
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### Newsletter information

#### NEWSLETTER ARTICLES AND VOLUNTEERS WELCOME

The ACES Newsletter is always looking for articles, letters and short communications of interest to ACES members. All individuals are encouraged to write, suggest or solicit articles either on a one-time or continuing basis. Please contact a Newsletter Editor.

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If you wish to place an advert in the Newsletter, please contact me at [apd@dmu.ac.uk](mailto:apd@dmu.ac.uk) to discuss. The deadline is one month before the scheduled month of publication.

The cost is \$50 per entry (approximately  $\frac{1}{4}$  printed page)

Remember, the Editor reserves the right to reject advertisements

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**The last word**

**If I were to begin my studies again, I would follow  
the advice of Plato and start with Mathematics.**

Galileo

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