ADVANCE PROGRAM

REGISTRATION FORM

The Antenna Measurement Techniques Association (AMTA)

In Cooperation with the

Washington DC/Northern Virginia Chapters of the
IEEE Antennas and Propagation Society
and the
IEEE Electromagnetic Compatibility Society

Proudly Presents

Antenna Modeling and Measurement in Challenging Environments

Monday, March 5, 2012

The Williamsburg Lodge at Colonial Williamsburg
Williamsburg, Virginia

Program Agenda

7:30 am	**REGISTRATION & CONTINENTAL BREAKFAST**
8:30 am	**IEEE/AMTA Welcome** *Dr. Brian Fischer, AMTA President*
8:45 am	**Microwave Electromagnetic Research at NASA Langley Research Center** *Mr. Erik Vedeler, NASA Langley*
9:30 am	**Advanced UWB Antenna Designs and Optimizations** *Dr. Chi-Chih Chen, The Ohio State University*
10:00 am	**Using Frequency Diversity to Improve Measurement Speed** *Mr. Steve Nichols, MI Technologies*
10:30 am	**BREAK**
11:00 am	**In-situ Modeling Antennas on Military Platforms** *Dr. Steve Weiss, Army Research Lab (ARL)*
11:30 am	**Advanced Computational Tools for Antenna Placement Studies** *Dr. C.J. Reddy, EM Software & Systems*
12:00 pm	**LUNCH**
1:00 pm	**A Cone Shaped Tapered Chamber for Antenna Measurements in both the Near and Far Field from 200 MHz to 18 GHz** *Dr. Vince Rodriguez, ETS-Lindgren*
1:30 pm	**An Overview of Antenna Research & Development Efforts in CERDEC S&TCD** *Dr. Rony Shahidain, Space and Terrestrial Communications Directorate CERDEC*
2:00 pm	**Millimeter and Sub-millimeter Wave Near-field Test Technology** *Dr. Daniël Janse van Rensburg, NSI*
2:30 pm	**BREAK**
3:00 pm	**Electro-Magnetic Interference Measurements on the Shuttle Orbiter "Discovery" in Preparation for Return to Flight - A Case Study** *Dr. Brian Kent, Chief Scientist, Sensors Directorate, Air Force Research Laboratory, Wright Patterson AFB*
3:45 pm	**CONCLUDING REMARKS** *Professor Chi-Chih Chen, The Ohio State University AMTA Technical Coordinator*
4:00 pm to 5:00 pm	**RECEPTION WITH SPEAKERS AND EXHIBITORS**

TECHNICAL PROGRAM

Presentation Abstracts

Presentation Title: Microwave Electromagnetic Research at NASA Langley Research Center

By Mr. Erik Vedeler, Head of the Electromagnetic and Sensors Branch at NASA Langley, Virginia

Abstract: The Electromagnetics and Sensors Branch (ESB) is involved with research supporting Aeronautics and Space Science for NASA. The primary focus is research rather than development but there is often a push for the branch's technology development through the mid TRL (Technology Readiness Levels) of 4, 5, 6 which covers the electromagnetic spectrum from RF/ microwave, millimeter wave, terahertz, infrared and optical. About 75% of the 30 branch members support Aviation Safety technology research, either in the remote detection of kinetic air hazards (wake vortex, dry microburst, clear air turbulence, volcanic ash, high ice water content etc.) or detection, mitigation and diagnosis of lightning strike hazards on composite aircraft. In addition to the Aviation Safety research, ESB investigates antenna, radar cross section and meta material problems and applications for NASA as well as external partners through Space Act Agreements. This presentation will focus on the RF/microwave measurement research in the work mentioned above.

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Presentation Title: Advanced UWB Antenna Designs and Optimizations

By Professor Chi-Chih Chen, The Ohio State University, Columbus, Ohio

Abstract: Ultra-wideband (UWB) antennas are important in supporting modern software-defined radios, software-defined radars, and advanced coding schemes, which demand more frequency bands and wider frequency bandwidths to achieve higher data rate, improved security, and better accuracy. For examples, MIMO and cognitive radios and radars can utilize frequency agility or bandwidth to greatly improve sensitive and avoid interference. Deploying a single UWB antenna for covering multiple communication or radar bands can also avoid performance degradations as a result of absorption or scattering of multiple co-located antennas operated in different bands. Needless to say, UWB antenna could help reduce overall operation cost, inventory, and visibility. Designing an UWB antenna requires careful consideration of radiation mechanisms and performance tradeoffs in order to obtain desired gain, pattern, and impedance performance at all frequencies. This presentation will demonstrate how numerical model simulation tools were utilized to optimized several relative complex UWB antennas including a UHF body-worn antenna system, a VHF-L monopole antenna, an extremely low-profile ferrite loaded VHF/UHF antennas, and a three-layer 2-18 GHz dielectric rod antenna.

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Presentation Title: Using Frequency Diversity to Improve Measurement Speed

By Mr. Steve Nichols, MI Technologies, Suwanee, Georgia

Abstract: Conventional antenna measurement systems use a multiplexer to sequence polarization and/or antenna elements as a function of time, requiring two or more measurement intervals. However, a simpler, more cost effective, and faster technique can be implemented by using frequency diversity to distinguish between polarizations or antenna elements. This paper describes how two slightly different frequencies can be used to make two measurements simultaneously instead of sequentially, cutting the measurement time in half. To implement this concept, two polarizations or elements are transmitted at the same time, requiring no multiplexing or control. The multiplexer at the source antenna is replaced by a power splitter and two modulators. Each modulator is fed with a different modulation frequency. This produces a spectrum at the output of each modulator with the carrier and two side bands separated by the different modulation frequency used. The output of each modulator drives a separate polarization

or antenna element. The signal input to the receiver consists of both channels simultaneously, but at slightly different frequencies, all within its IF bandwidth. The reference input to the receiver is formed by summing the outputs of the two modulators. The receiver must measure each frequency in a separate frequency channel, yielding both measurements simultaneously. By using a highly selective dual frequency receiver, the polarizations can be de-multiplexed by using frequency diversity. Proof of concept testing has been completed to demonstrate this capability, and preliminary results are presented in this paper.

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Presentation Title: In-situ Modeling Antennas on Military Platforms
By Dr. Steve Weiss, Army Research Lab (ARL), Adelphi, Maryland

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Presentation Title: Advanced Computational Tools for Antenna Placement Studies
By Dr. C.J. Reddy, EM Software & Systems (USA) Inc, Hampton, Virginia

Abstract: Recent advances in computational electromagnetic tools have made antenna design possible along with integration of antennas on various ground, sea and air platforms. Numerical computations can be performed to evaluate the effects of antenna placement, radiation hazard, EMC/EMI, etc. The typical numerical approaches include full wave techniques such as Method of Moments (MoM), Multilevel Fast Multipole Method (MLFMM) and asymptotic techniques such as Physical Optics (PO) and Uniform Theory of Diffraction (UTD). For many practical applications, sometimes it is necessary to study the electromagnetic behavior on a specific structure over a broad frequency band, and therefore it is important to have some benchmark data on computational resources needed for some commonly used numerical techniques. In this talk, representative full-size air, ground and sea platforms are considered and the frequency limit is pushed at different bands using several numerical techniques. The accuracy and computational resources are compared.

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Presentation Title: A Cone Shaped Tapered Chamber for Antenna Measurements in both the Near and Far Field from 200 MHz to 18 GHz
By Dr. Vince Rodriguez, ETS-Lindgren, Cedar Park, Texas

Abstract: Traditionally tapered chambers are constructed using a square based pyramidal shaped taper. The taper is then shaped into an octagon and finally transformed into a cylindrical launch section. This approach is related to the manufacturability of different absorber cuts. This presentation introduces a chamber where the conical shape of the launch is continued through the entire length of the tapered chamber. The results of the free space VSWR test over a 1.2m diameter quiet zone are presented at different frequencies. The conical taper appears to have a better illumination wave front and better QZ levels even at frequencies above 2 GHz than the standard traditional approach. The implementation of this design was done in Singapore and the actual chamber was designed to have a secondary near field range for planar and spherical scans.

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Presentation Title: An Overview of Antenna Research & Development Efforts in CERDEC S&TCD
By Dr. Rony Shahidain, Space and Terrestrial Communications Directorate CERDEC, Aberdeen, Maryland

Abstract: The Antenna and Spectrum Analysis (ASA) division in CERDEC S&TCD is composed of five branches. One of them, the Antenna Technology & Analysis branch, performs and

manages research on antenna technology using multiple research paths. The ATA branch has a prototype lab, a Specific Absorption Rate (SAR) lab, a modeling and simulation lab, and measurement facilities. The division has two RF anechoic chambers; one of them is dedicated for EMI/EMC testing, while the other one is used for general antenna measurements. Under constructions is a new RF anechoic chamber facility where a full size vehicle could be placed on a rotating pedestal for antenna measurement. In house efforts as well as out sourced efforts are mainly focused on developing antennas using novel materials (meta materials) and technology (nano technologies). The ATA branch works closely with industry, universities as well as other army and DOD R&D entities.

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Presentation Title: Millimeter and Sub-millimeter Wave Near-field Test Technology
By Dr. Daniël Janse van Rensburg, NSI, Torrance, California

Abstract: As frequencies extend into the mm-wave bands, the mechanical and RF requirements for near-field scanners become increasingly stringent. This presents a host of challenges to test system suppliers and new techniques are required to overcome limitations in both of these arenas. This paper gives an overview of these challenges and some of the techniques developed to address them. Existing test systems operational up to 1 THz (planar) and 500 GHz (spherical) will be described as examples. Parametric study data will also be presented to illustrate the aspects limiting maximum operational frequencies for these systems.

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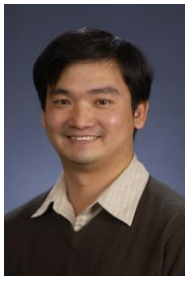
Presentation Title: Electro-Magnetic Interference Measurements on the Shuttle Orbiter "Discovery" in Preparation for Return to Flight - A Case Study
By Dr. Brian Kent, Chief Scientist, Sensors Directorate, Air Force Research Laboratory, Wright Patterson AFB, Dayton, Ohio

Abstract: As NASA prepared the Space Shuttle for its first return to flight mission (STS-114) in July of 2005, a number of new visual and radar sensors were used during the critical ascent phase of the flight to assess if unintentional debris was liberated from the Shuttle as it raced into orbit. New high-resolution C-Band and X-Band radars were used to help ascertain the location and speed of released debris. Both radars were also used to monitor debris generated by routine flight events such as Solid Rocket Booster (SRB) separation. To assure these new radars did not interfere with flight-critical engine subsystems, an Electromagnetic Interference (EMI) measurement was performed on the Shuttle Orbiter "Discovery" in January 2005, using the Air Force Research Laboratory's Mobile Diagnostic Laboratory (MDL). This portable EM Measurement system performed a large number of attenuation measurements on January 17-18, 2005. This paper describes how the attenuation data was acquired and the methodology used to reduce the data to predict average attenuation of the radar energy from the outside world to the inside of the aft engine bay of the Orbiter. This data was combined with a separate NASA performed avionics EMI analysis to demonstrate that the new C and X-Band Debris Radars could be operated without adversely interfering with the Orbiter aft bay avionics systems.

SPEAKER BIOGRAPHIES



Chi-Chih Chen received his MS and Ph.D. degrees from The Ohio State University Electrical and Computer Engineering Department in 1993 and 1997, respectively. He has been with The Ohio State University ElectroScience Laboratory (ESL) since 1993 as a Postdoctoral Researcher (1997~1999), Senior Research Associate (1999-2003), and Research Scientist in (2004~2011). He became Research Associate Professor at the OSU Electrical and Computer Engineering Department in 2011. Dr. Chen’s research interests include ground

penetrating radars (GPR), buried target detection and discrimination, ultra-wideband antennas, small antennas, GPS and GNSS antennas, and body-worn antennas. He has published 42 journal papers, 117 conference papers, 60 technical reports, five book chapters, and one co-authored book. Dr. Chen has given short course on GPR technology, small antenna design, and ultra-wideband antenna designs. Dr. Chen has served as reviewer for more than 13 international journals. He has served on the Technical Program Committee and Review Committee for IEEE APS/URSI and IGARSS symposiums; as Treasurer, Vice Chairman and Chairman of the Joint IEEE AP/MTT Columbus Chapter; Technical Chair of the 2006 International GPR Conference, International Advisory and Science Committee of the International GPR Conference since 2006. Dr. Chen received The OSU Lumley Engineering Research Award in 2004 and 2010. He is a member of SEG, Sigma Xi, Phi Kappa Phi, senior member of IEEE, and Edmund S. Gillespie Fellow of AMTA. He is also currently serving on the AMTA Board of Directors as the 2012 Technical Coordinator.

Dr. Daniël Janse van Rensburg has been working in the microwave test industry for the past 20 years, both as user and supplier of automated antenna test systems. His particular fields of interest are measurement error analysis & computational electromagnetic modeling. He graduated from the University of Pretoria, South Africa and was awarded the B. Eng (cum laude), M. Eng and Ph.D. degrees in 1985, 1987 and 1991 respectively, all in Electrical Engineering. He joined the Canadian Space Agency as research engineer in 1994 and in 1996 he joined COMDEV's Space Division in Cambridge, ON, Canada. Dr Janse van Rensburg has been working for Nearfield Systems Inc of Torrance California since 1997, first as test applications engineer and currently as manager of the sales & marketing department. He is also actively involved in academia and was appointed as adjunct professor in 2005 in the School of Information Technology and Engineering, University of Ottawa, Ottawa, ON, Canada, where he provides post graduate student supervision. He is a Senior Member of the IEEE, Fellow of the AMTA and Licensed Professional Engineer in Ontario, Canada. He served on the AMTA BOD from 2005 – 2007 and as President in 2007. He is the author of more than 50 journal and conference papers and regularly contributes to industry courses on near-field test technology.

Dr. Brian M. Kent is Chief Scientist, Sensors Directorate, Air Force Research Laboratory, Wright-Patterson Air Force Base, Ohio. He serves as the directorate's principal scientific and technical adviser and primary authority for the technical content of the science and technology portfolio. He evaluates the total laboratory technical research program to determine its adequacy and efficiency in meeting national, Department of Defense, Air Force, Air Force Materiel Command and AFRL objectives in core technical competency areas. He identifies research gaps and analyzes advancements in a broad variety of scientific fields to advise on their impact on laboratory programs and objectives. He recommends new initiatives and adjustments to current programs required to meet current and future Air Force needs. As such, he is an internationally recognized scientific expert, and provides authoritarian counsel and advice to AFRL management and the professional staff as well as to other government organizations. He also collaborates on numerous interdisciplinary research problems that encompass multiple AFRL directorates, customers from other DOD components, as well as the manned space program managed by NASA. Dr. Kent has authored and co-authored more than 90 archival articles and technical reports and has written key sections of classified textbooks and design manuals. He has delivered more than 200 lectures, and developed a special DOD Low Observables Short Course that has been taught to more than 2,000 scientists and engineers since its inception in 1989. Dr. Kent has provided technical advice and counsel to a wide range of federal agencies, including the Department of Transportation, the Department of Justice and NASA's Space Shuttle Program. He is also an international technical adviser for the DOD and has provided basic research guidance to leading academic institutions.

He received his BSEE degree with highest honors, from Michigan State University in 1980, his MSEE degree from The Ohio State University in 1981 and the Ph.D. degree in electrical engineering from The Ohio State University in 1984.

Mr. Steven R. Nichols has over 30 years of experience in engineering design and technical management, much of it spent developing instrumentation products and systems for antenna measurement applications. After receiving his Bachelor of Electrical Engineering degree from Georgia Institute of Technology in 1980, he joined the Microwave Instrumentation Division of Scientific Atlanta as a design engineer. There he led and participated on teams to develop a series of products that formed the core electronic equipment of the business. Later, Nichols managed several engineering organizations and was promoted to Director of Design Engineering. In that role, he led a technical staff of 60 to develop satellite tracking ground systems. Mr. Nichols, then, became the Director of R&D for Satellite Networks, managing product development for telephony and data VSAT systems, and continued in this role after the business was sold to ViaSat. In 2002, Nichols joined MI Technologies and currently heads the Product Engineering department, where he is leading the development of new advanced instrumentation products and systems.

Dr. C. J. Reddy is the President of EM Software & Systems (USA) Inc. (www.emssusa.com). At EMSS (USA), he is leading the marketing and support of commercial 3D electromagnetic simulation software, FEKO (www.feko.info) in North America. Dr. Reddy is also the President and Chief Technical Officer of Applied EM Inc, (www.appliedem.com), a small company specializing in design and development of innovative antenna solutions and computational electromagnetics. At Applied EM, Dr. Reddy successfully led many Small Business Innovative Research (SBIR) projects for the US Department of Defense (DoD). Dr. Reddy is a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE) and also a Senior Member of the Antenna Measurement Techniques Association (AMTA). He is also a member of the Applied Computational Electromagnetic Society (ACES) and serves as a member of Board of Directors. He has published 35 journal papers, 54 conference papers and 17 NASA Technical Reports to date. Dr. Reddy was the General Chair of ACES 2011 Conference (http://aces.ee.olemiss.edu/conference/2011/) held in Williamsburg, VA during March 27-31, 2011.

Dr. Vicente Rodríguez attended The University of Mississippi (Ole Miss), in Oxford, MS, where he obtained his B.S.E.E. in 1994 as well as his M.S. and Ph.D. degrees in Engineering Science with an emphasis on Electromagnetic Theory in 1996 and 1999, respectively. In August 1999, Dr. Rodríguez joined the department of Electrical Engineering and Computer Science at Texas A&M University-Kingsville (formerly Texas A&I University) as a Visiting Assistant Professor. In June 2000, Dr. Rodríguez joined EMC Test Systems (now ETS-Lindgren) as an RF and Electromagnetics engineer. In September 2004, Dr. Rodríguez assumed the position of Senior Principal Antenna Design Engineer, placing him in charge of the development of new antennas for different applications. Dr. Rodríguez's interests include numerical methods in electromagnetics, especially when applied to antenna, EMC and RF/MW absorber design and analysis. Dr. Rodríguez is the author of more than twenty publications and holds patents for hybrid absorber and for a new double-ridged horn antenna. Dr. Rodríguez is a senior member of the IEEE and several of its technical societies including the AP, MTT and the EMC Societies. He is also a senior member of the Antenna Measurements Techniques Association (AMTA) and currently serves on its Board of Directors.

Dr. Rony Shahidain joined the CERDEC S&TCD in 2008. He was previously in academia before joining the DOD. He has been managing the Breakthrough Antenna Technology - Army Technology Objective Research (BAT ATO-R). BAT ATO-R is funding universities, industries and other DOD entities to research and develop antennas and antenna technology. Dr. Rony Shahidain earned his Ph.D. from the University of Alabama in Electrical Engineering and bachelor's degree in Physics (Honors) from Dhaka University.

Mr. Erik Vedeler has been working at NASA Langley Research Center in Hampton Virginia since 1988, starting out as a microwave measurements researcher. Since 2007 he has been the head of the Electromagnetics and Sensors Branch focusing on microwave, RF and lidar/electro optics research. Much of the current research in the branch is focused on the detection of kinetic air hazards and lightning protection for NASA's Aviation Safety Program, Antenna and Radar Cross Section measurements, and lidar science instrument research. Prior to his current position he was a senior researcher in the branch leading the microwave measurements group. He led several aerospace antenna projects and his interest in compact range research and development covered many components such as reflector edge treatments, absorber design and layout, broad band feeds and model supports. With his work in compact range technology, he was an early member of the Radar Cross Section (RCS) Measurements Working Group whose mission focus became facility certification standardization. This group eventually became part of the Signature Measurements Standards Group where he served as an RCS range certifier. Erik has a master's degree in electrical engineering from New Mexico State University and lives in Yorktown Virginia with his wife of 21 years, Jessica.

Dr. Steven Weiss has been employed with the Army since 1989. As the leader of the antenna team, Dr. Weiss has helped to make ARL a leading force in the area of antenna research and development from both his personal expertise and from his leadership role in helping the team shape areas of future research. Dr. Weiss has been responsible for organizing the team in its research efforts to investigate a number of wide ranging antenna applications. For example, his team is presently developing novel Rotman Lens based antenna array for Terrestrial Communications, a 76 GHz antenna array for collision avoidance, a demonstrator array for Satellite On The Move (SOTM) at the Ka-band and a MEMs-based electrically scanning array for a compact radar. Each of these efforts represents a unique blend of applied research directed toward challenging engineering problems. Besides these larger efforts, his team has also developed many antennas for specialized military applications with particular emphasis on in-situ modeling. In addition to his work at the Army Research Lab, Dr. Weiss has maintained his professional stature through teaching and professional affiliations. He has taught graduate level courses on antennas and Electromagnetics at the Johns Hopkins University for the last 10 years. At the Catholic University, teaches a graduate course on mathematical methods. Dr. Weiss is a senior member of the IEEE Antennas and Propagation Society and has published numerous conference and journal papers. He is a member of URSI and has been elected as a USNC-URSI Member-at-Large representing the US on an international level. Dr. Weiss is also a member of the Applied Computational Electromagnetics Society (ACES) and has numerous conference and journal publications. Dr. Weiss received his Bachelor's degree (BSEE) from the Rochester Institute of Technology in 1985. He received a Master (MSEE) and Doctor of Science (D.Sc.) degrees from the George Washington University in 1989 and 1995 respectively in majoring in Electrophysics.

Event Overview

The Program

This program was designed to bring the latest technology related to RF and antenna measurement techniques to the local community. Experts in the industry will share practical information on various topics in an extended presentation format. This allows a thorough discussion of each topic and provides the opportunity for extended questions and answers. The "hands-on" quality of the presentation enables the registrant to learn useful information that can be used on the job – in the "real world." Attendees will also be educated on the latest research and development efforts underway at various government agencies.

The Exhibition & Reception

There will be an exhibition by vendors of antenna, test and measurement related products and services in a ballroom neighboring the technical presentation area. These products and services address the needs of the commercial, military, and aerospace industries. During the reception from 4:00 to 5:00 pm in the exhibit area, heavy appetizers and a hosted bar will be available. AMTA and IEEE members are welcome to attend the reception only at NO CHARGE provided a registration form is completed and sent in advance. A badge will be available for the reception only attendees upon arrival at 4:00 pm. *Thus, if you can't join us for the entire day, drop by for the reception and exhibition to network with AMTA and IEEE. You can see demonstrations, meet the speakers, and you might even win a raffle prize!*

Colloquium and Exhibition Location

The Williamsburg Lodge
310 South England Street
(adjacent to the Colonial Williamsburg historic area)
Williamsburg, Virginia 23185
Phone: 757-253-2277
http://www.colonialwilliamsburg.com/visit/hotels/williamsburglodge/

Hotel Guest Room and Parking Information

A limited number of guest rooms are being held for "AMTA/IEEE" at the rate of $149.00 (includes wireless internet access in the guest room), plus tax, for single or double occupancy, and are available on a first come, first serve basis. **Please reserve by the cut-off date of February 13 to ensure guest room availability**. Call the hotel directly at 800-261-9530 between the hours of 8:30 am – 5:00 pm Eastern Standard Time or make your reservation on line at https://resweb.passkey.com/go/19931. Self-parking is available at no charge at the hotel; valet parking is $10 per day.

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REGISTRATION FEES

AMTA/IEEE Members, Received by February 10	**$125**
AMTA/IEEE Members, Received February 11 – March 2	**$175**
AMTA/IEEE Members, After March 2 and On-Site	**$225**
Non Member Additional Charge*:	**$50**
Full-time Students with copy of valid Student I.D., Received by February 17:	**$40**

NOTE: Unemployed/retired attendees:
Take a 50% discount off the AMTA/IEEE Member fees above.

*Includes one year membership in AMTA.

NOTE: *The registration fee includes one copy of the colloquium record, continental breakfast, lunch, refreshment breaks, and the reception. The organizing committee reserves the right to substitute speakers, restrict size, or to cancel the colloquium and exhibition. In the event the organizing committee cancels this event, registration fees only will be fully refunded. Individuals canceling their registration prior to February 5 will receive a full refund. No refunds will be made to individuals who cancel their registration after February 5. Substitutions are allowed. Attendance is limited. Registration will be confirmed on a first come, first served basis.*

Registration Information

Please print clearly

Name:_____
Title: _____
Company: _____
Street Address: _____
City: _____ **State:** _____ **Zip:** _____
Daytime Phone: _____
E-mail Address: _____
AMTA or IEEE Member: Y___ N___
IEEE #: _____
Full-time Student: Y___ N___
School: _____
(Please attach copy of Student ID to obtain Student rate.)

Registration by Mail/Fax/On-Line

Registration Total per Fees Above

Check Enclosed in Amount of: $_____
(Checks payable to: AMTA)

Or

Credit Card Payment – Please Provide:
Name on Card: _____
Credit Card No: _____
Expiration Date: _____
Amount Charged: $ _____

Signature: _____

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