



# Chapter Chatter

Todd Robinson, Associate Editor

## Where the Wind Blows

By Mike Violette

Turning at a lazy six RPM a typical wind turbine cranks out 30 kW without releasing a puff of CO<sub>2</sub>. A collection of wind turbines (thirty or so) rises over the rolling countryside in a rural Midwest state; the blades whoosh like the respirations of a sleeping giant. Not long ago we received a call about possible interference to some of these marvels. My VP Steve Ferguson and I made the jaunt to the heart of the US to have a look, and, hopefully, lend a hand.

Balanced on the top of a 300' foot tall hollow steel tube, the turbine "nacelle" is about the size of a small Winnebago, but with fewer appointments. A massive steel shaft connects the hub of the turbine to a transmission that ups the speed to 1200 RPM, driving a generator which, in turn, pushes joules to an inverter system that matches the voltage and frequency output of the assembly to the electrical grid.

If it were only that simple. These machines are feats of engineering achievement, considering the electrical, control, structural and materials puzzles that had to be solved. The technology, though, is becoming *de rigueur* as more countries install wind-generating capacity to sate the rising energy demands and, maybe, mitigate rising sea levels.

To maintain the rotational speed at the optimum 6 RPM, the control electronics in the hub of the unit adjusts the pitch of the blades. Other circuitry aims the nose of the turbine into the wind and the entire assembly is designed to extract the most energy from breezes down to a few miles per hour.

The robust engineering, however, had an Achilles heel. About three miles north of the installation is a NOAA weather radar station, pumping out L-band (1–2 GHz) energy. Intermittently, the pitch-positioning sensors—delivered from encoders mounted on the blades to the control circuitry—would register an erroneous "out of bounds" indication. The control software, sensing a potentially unsafe condition, would trip the turbine and the thing would shut down to a safe mode. Obviously, this halted the energy production from that unit. Given that the most-affected units were closer to the source, the radar was immediately suspected. The intermittent aspect of the problem was probably due to the varying orientation of the turbine to the L-band source, that is, the incident angle of the radar signal relative to the circuit varied with wind direction.

Our task was two-fold: to measure the field levels at the top of the wind turbine and, hopefully, find a "fix" to the problem. Our other objective was to get up and down the wind turbine without suffering cardiac arrest.

The trip up the tube was a hand-over-hand ladder climb (300 rungs, more or less). Fortunately, we were blessed by a



Fig. 1. Can I Just Take the Elevator?



Fig. 2. Steve Pops out the Top of the Nacelle.



Fig. 3. That First Step is a Doozy.

seasonable February day with light winds and temperatures in the 40s. Not bad for climbing in retrospect and the swaying of the tower was minimal. It took us a good 45 minutes to make the ascent (including rests) and we popped the hatch on the nacelle to a wide view of the open country side.



*Fig. 4. Mike on the top of Wisconsin. Note NOAA weather radar station visible to the right.*

Now, for me, flying in little planes is not a big deal and tours of the top of tall structures doesn't normally make me nervous, but standing atop this wind turbine made me just a little...unsettled. Our guide, a seasoned technician and part-time hog farmer, strolled around the top of the nacelle like he was in his living room. I am not ashamed to say that I stayed pretty close to the hatch and re-checked my safety harness more than once.

The tower was equipped with a hoist that carried our spectrum analyzer, antennas and other necessary doo-dads to the top. We just had to haul our own bulk up to the top of the tower. Another fortunate design feature is the installation of "rest decks" at intervals along the ladder. We took advantage of these, to be sure. Over the gasps of trying to catch my breath at one of the rest-stops I asked our guide what was the "record" time of a climb up the tower. "There's one guy here who can do it in six minutes, without stopping." Show-off.

Once we got up to the top, we collected our data, setting up our equipment in the relative comfort of the nacelle proper. Verily, we measured a peak field strength of  $\sim 25$  V/m from the radar. However, the control electronics were housed in the "nose" of the hub. Crawling over the top of the nacelle from the hatch to the hub was probably the most, ahem, thrilling part of the job. Fortunately, I held my water and made it into the hub section, a cozy spot with just enough room for two. At this point, it was really only possible for a physical inspection of the design (which we continued on the ground with the control electronics assembly on the bench). What was evident was the use of plastic-coated metallic conduit from the pitch sensor head to the control electronics. Shielded? Most definitely, but the water-tight connection at the enclosure entry looked a little fishy: how was the cable assembly "shield" grounded?

Resolution. Further to our clambering up and down the turbine and finishing up the measurement part (we took some additional data farther away from the radar to see how the propagation changed) we continued our inspection and posited that the radar energy was entering the enclosure via the cable. We confirmed by inspection that the plastic weather seal isolated the metallic conduit from the metal gland nut at the enclosure ends.

Solution: Home Depot. The "fix" was as simple as the window aisle at the local hardware store. Our recommendation was to over-wrap the control cable with window screen, "grounding" the screen at both ends, secured by heavy duty cable ties. Things have been working flawlessly for almost two years. Consider that our contribution to the fight against climate change. New technologies, but an EMC solution as old as the wind.

## BeNeLux

Cees Keyer reports that the BeNeLux (Belgium, Netherlands, Luxembourg) EMC Chapter, in cooperation with the Dutch EMC-ESD Society and Hogeschool van Amsterdam, organized the EMC-ESD Practical Day on October 27, 2010. The mini-symposium was held at

the Hogeschool van Amsterdam (Amsterdam University of Applied Sciences) Department of Electronic and Electrical Engineering. After a lively key note speech by the chair of the EMC-ESD Society, IEEE EMC Society Distinguished Lecturer, Professor Giulio Antonini, gave a talk entitled,

"Spectral Methods for Time-Domain Analysis of High-Speed Interconnects." His presentation was mathematical but very interesting for the PCB designers and integrated circuit designers in attendance. The mini-symposium also featured a vendor display area where numerous companies displayed their



*Professor Antonini (right) is shown with Jorien Schreuder, Manager – Department of Electronic Engineering, at the October mini-symposium of the Belgium/Netherlands/Luxembourg Chapter.*



*Attendees are shown arriving for the technical presentations at the October mini-symposium of the Belgium/Netherlands/Luxembourg Chapter.*



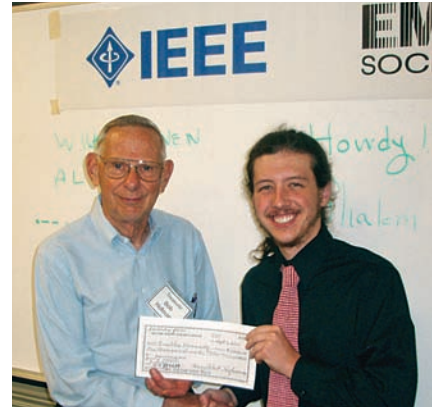
*Johan Catrysse (right) is shown with Cees Keyer, the local organizer of the Belgium/Netherlands/Luxembourg Chapter's October mini-symposium.*

equipment and services. The breaks during the EMC-ESD practical day were a great opportunity to network and catch-up with friends and colleagues. The final lecture was given by Johan Catrysse, and the topic was, "EMC of Large Systems." All the presentations, partially in Dutch, can be downloaded from: [http://www2.fhi.nl/praktijkdag/page.php?page\\_id=4](http://www2.fhi.nl/praktijkdag/page.php?page_id=4)

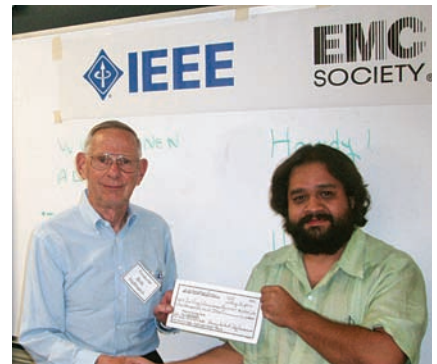
### Chicago

Jerry Meyerhoff, Chapter Secretary, reports that the Chicago IEEE EMC Chapter's fall 2010 season started one month earlier than usual on August 25 at the IIT Rice campus in Wheaton, IL. The Chapter provided a pizza dinner for the social hour and is soliciting sponsors to step up for future events. Chair Jack Black opened the meeting for our 30 attendees in the auditorium with brief announcements and introductions of Chapter officers and notable guests. The

"jobs available" segment produced seven opportunities for members in need to pursue. The guest speaker, Daniel D. Hoolihan, is currently President of his own EMC consulting firm in Minnesota after working many years at AMADOR and Control Data Corp. Dan has served the EMC Society as President, on many board and committee positions as well as in his local Chapter which he helped found in 1985. Dan also serves on or advises multiple government and industry technology and standards agencies. We're fortunate to have him as our Chapter Angel. Dan's talk, "Radiated Emission Measurements at 1/3/5/10/30 Meters" explored the history and physical basis of the familiar measurements. He emphasized the big three underlying assumptions and their limitations: 1/d field strength vs. distance, free-space and far-field. Dan noted situations where they clearly apply, as well as when the fit may be awkward or even inappropriate, particularly as products and technology continue to evolve. The lively audience participation with questions and shared experiences nicely expanded the discussion. Dan encouraged everyone to read the referenced papers for further understanding. The second meeting, again organized by Programs Chairs, Andrea Spellman of UL and Tom Braxton of Shure Inc., was on September 15, kindly hosted at the ITT Technology Institute in Mt. Prospect, IL. This meeting attracted 41 eager listeners and 20 engineering students from ITT Professor Mike Reed's class. The popular local Wapaghetti's pizza provided by the Chapter may also have boosted attendance. Treasurer and Scholarship Chair



*Chicago Treasurer Bob Hofmann (left) presents the scholarship award to Vic Palacios of DeVry University.*



*Chicago Treasurer Bob Hofmann (left) presents the scholarship award to Jeremy Borgman of Bradley University.*

Bob Hofmann awarded \$1,000 scholarships to two worthy electrical engineering students: Vic Palacios who leads the DeVry University IEEE Student Chapter and Jeremy Borgman of Bradley University who is active in his IEEE student Chapter and the Electronics Club. Our



*Dan Hoolihan (far right) makes a point about 3 Meter measurements at the September Chicago Chapter meeting.*



*Chicago Chapter Chair Jack Black (right) presents the speaker recognition plaque to Dr. Sergiu Radu at the September meeting.*

speaker was Dr. Sergiu Radu, an EMC Society Distinguished Lecturer from Oracle, previously Sun Microsystems. <http://www.ewh.ieee.org/soc/emcs/dl-main.html>. His expansive talk, "PCB Level EMC Design" in 12 Chapters, captivated all eyes and ears for nearly two hours. Dr. Radu provided many take-aways which engineers could apply to their own high frequency microprocessor server designs. The next Chicago meeting will be the famous Oktoberfest Feast to satisfy both body and the mind, sponsored by ELITE Electronic Engineering. The speaker Dr. William Radasky, IEEE Fellow and founder of Metatech, will address High Power E-M Threats to the Power Distribution System. The Chicago Chapter continues to be blessed with active volunteer officers and committee members who create programs and activities to serve our large membership. Please visit the Chapter's website, skillfully maintained by Frank Krozel of EIA, for future meeting information [www.emcchicago.org](http://www.emcchicago.org).

## Hong Kong

The IEEE Hong Kong EMC Chapter held a successful technical seminar at the City University of Hong Kong on 11 September 2010. Mr. Edmund Lai of Electrical and Mechanical Service Department, Hong Kong SAR Government presented the first topic on "Electrical Product Safety Regulations in Hong Kong." Mr. Kevin Leung of Specialized Technology Resources (H.K.) Ltd. presented the second topic on "Safety Assessment of Electrical Household Appliances." Mr. Steven Tsang of Bureau Veritas Hong Kong Limited presented the third topic on "Electromagnetic



*Mr. Edmund Lai is shown presenting the topic, "Electrical Product Safety Regulations" to the Hong Kong Chapter in September.*



*Mr. Kevin Leung presents a paper on the topic, "Safety Assessment of Electrical Household Appliances" to the Hong Kong Chapter in September.*



*Mr. Steven Tsang speaks to the Hong Kong Chapter about "Electromagnetic Compatibility for Household Appliances."*



*The speakers and the committee members of the Hong Kong EMC & PSE Chapters taking a group photo before their September 2010 seminar. From left, Dr. Peter Leung, Dr. Brian Chan, K W Chen, Howard Wan, S L Mak, Wilson Loke, Steven Tsang, Kevin Leung, Edmund Lai, Dr. Patrick Wong (Chairman of the Hong Kong EMC Chapter), Perry Ho, Horace Lau, and Henry Yuen.*

Compatibility for Household Appliances." A total of 65 participants attended the seminar.

## Nanjing

The IEEE MTT-S/AP-S/EMC-S Joint Nanjing Chapter was a technical co-sponsor of the 2010 International Symposium on Signals, Systems and Electronics (ISSSE2010), held in the Mandarin Garden Hotel, Nanjing, China on September 17–20, 2010. This symposium is held every three years, and is organized under the guidance and sponsorship of the international steering committee of the URSI Commission C (Radio Communication Systems and Signal Processing) and D (Electronics and Photonics). There were 310 papers submitted to ISSSE 2010 from 33 countries and regions. A total of 253 papers were accepted after a peer review by the technical program committee members. The acceptance rate of the conference was 82%. The registered attendance was 255 people, including 245 who pre-registered and 10 on-site registrations. The conference events consisted of five keynote presentations, 18 oral sessions, seven poster sessions, and three shared tutorials with ICUWB2010. Three papers were awarded best student paper in the best student paper competition. Five companies, including one platinum sponsor, participated in the industrial exhibition. The IEEE MTT-S/AP-S/EMC-S Joint Nanjing Chapter also co-sponsored the 2010 IEEE International Conference on Ultra-Wideband (ICUWB2010) at the Mandarin Garden Hotel, Nanjing, China on September 20–23, 2010. This conference provided a forum for the latest UWB systems, technologies and applications in both microwave and millimeter wave bands. ICUWB2010 is a continuation of a series of annual international UWB conferences. A total of 407 papers were submitted to ICUWB2010 from 33 countries and regions. The 69 technical program committee members from 18 countries reviewed the papers for their technical merits and the interests to the UWB communities. A total of 219 papers were accepted for presentation in ICUWB2010, and the registered attendance was 227 people. This was a very large event that included five keynote speakers and five invited talks from universities and industrial sectors. Also included were one special session



*The Mandarin Garden Hotel, venue for the 2010 International Symposium on Signals, Systems and Electronics, and the 2010 IEEE International Conference on Ultra-Wideband, both co-sponsored by the Nanjing EMC Chapter.*



*Committee members from the 2010 International Symposium on Signals, Systems and Electronics, co-sponsored by the Nanjing EMC Chapter.*



*The Best Student Paper Awards are presented at the 2010 IEEE International Conference on Ultra-Wideband, co-sponsored by the Nanjing EMC Chapter.*

“Development of UWB in China”, 20 oral sessions, five poster sessions and three shared tutorials with ISSSE2010. Three papers were awarded best student

paper in the best student paper competition. Seven companies, including one gold sponsor and two silver sponsors, participated in the industrial exhibition.

## Phoenix

Glen Gassaway reports that the first IEEE EMC Phoenix Chapter meeting of the fall was held on September 21, 2010 at Garcia’s Mexican Restaurant in the Embassy Suites Hotel in Tempe, AZ. Our featured speaker was Kevin Slattery, the Manager for Advanced Signaling and Interference Technologies at Intel, who has been working in the field of EMI/EMC for 18 years and has developed measurement techniques and analytical approaches for the evaluation of high speed processors, chipsets, LAN, and display electronics. With the advent of mobile computing, wireless communication has become an integral part of the computer platform. Wireless is now ubiquitous in laptops, and modern cell phones contain several integrated communications devices. The problem is these devices were never intended to coexist. Mr. Slattery presented a wealth of novel approaches to ensure reliable communications performance. It is a sobering thought that 3 dB of noise can reduce the performance of your communications system by 50%. It is even more sobering that 20 or even 30 dB of noise is common on some devices. In various bands, emissions suppression requirements to provide compatibility between digital electronics and co-existing communications devices are 30 dB more stringent than meeting FCC radiated emissions requirements. Some solutions have involved the use of costly metal shielding. Other solutions are far superior. The designer needs to think that mitigation schemes are layered, where one can use a number of methods to achieve compatibility. The careful use of differential signaling can be beneficial, but it must be considered that imbalanced differential systems are not ideal because of differential to common mode conversion. A skew of 75% of the waveform rise time can completely negate the benefit of differential signaling. Skew can be introduced by unequal trace or wire lengths, and can even be affected by changes in wire insulation relative permittivity. The speaker noted that in some cases it is necessary to specify wire insulation permittivity along a wire’s length! Even with the best differential signaling design practices, one typically still needs 5–10 dB of additional isolation. Another digital technique involves the use of a pseudo-random bit stream. Synchronized periodic signals emit on the order of 20 dB more than random signals. When



*Kevin Slattery, speaking to the Phoenix Chapter, provides some unique ideas to combat platform interference to a large turnout in Phoenix.*

a system's clock or synch signals are pseudo-random, significant interference reduction is achieved. The speaker told us of his experimentation with a variety of clock wave shapes, which he analytically and empirically optimized to achieve minimum noise at the system's communications bands. Other techniques include careful selection of clock frequencies, which can be adjusted so high order harmonics do not reside within system receiver bands. If it is impossible to move a clock frequency that far, then it may at least be reasonable to change the clock frequency where an odd harmonics falls within the receiver band instead of an even harmonic (or vice versa). Antenna placement is also critical. It's best to move communications antennas as far away from the emissions source as possible. As an example, a Wi-Fi antenna placed across the top of a laptop display can be very close to display drivers.

## Romania

Andrei Marinescu, Romania IEEE EMC Chapter Chair, reports that on June 30, 2010 the IEEE EMC Romania Chapter, in cooperation with the Research, Development and Testing National Institute for Electrical Engineering (ICMET Craiova), Romanian EMC Association (ACER), National Authority for Scientific Research (ANCS) and Romanian Academy for Technical Sciences (ASTR), organized a workshop on "Electromagnetic Shielding in Modern Technique." The half day meeting took place at the ICMET Craiova with 49 attendees from Romanian universities, research institutes and test laboratories; of these, 20 participants were young engineers or researchers. The event was started by the General Manager of ICMET, Marian DUTA, who thanked the participants for their interest in

attending. Next, Professor Andrei Marinescu, Chair of Romanian EMC Chapter, presented the workshop program and welcomed the participants to this event. The scientific event was started by Professor Andrei Marinescu with "Introduction in Electromagnetic Shielding Issues." His presentation addressed the scope of electromagnetic shielding methods for determining shielding effectiveness, applicable standards and the need to update their measurement uncertainty, etc. Next, Professor Alimpea Ignea from the University "Politehnica" Timisoara presented a tutorial about "shield and shielding" which included a review of basic concepts. The technical program sessions included a number of important papers including: "Electromagnetic Shields/Absorbers Based on Chiral Honeycomb Structures," by Valeriu David, Ionut Nica, and Alexandru Sălceanu, of the Technical University; "Method for SAR Reduction When Using Mobile Phone Terminals" by Andrei Marinescu, Ionel Dumbravă, and Violeta Voicu of ICMET Craiova; "Attenuation of Mains Frequency Magnetic Fields in Electric Power Installations" by Sorin Coatu, Marian Costea, and Dan Rucinschi of the University "Politehnica" Bucharest; "The Assessment on Magnetic Fields Generated by High Voltage Lines and Circuits From Substations," by Ileana Baran, Sorin Coatu, Marian Costea, and Dan Rucinschi of the University "Politehnica" Bucharest; and "Progress in International Standardization Regarding The Shielding Effectiveness," by Dan Rucinschi, Sorin Coatu, and Marian Costea, of the University "Politehnica" Bucharest. The workshop papers and the photo gallery can be found on the websites [www.icmet.ro/lista\\_lucrari\\_ws\\_2010.pdf](http://www.icmet.ro/lista_lucrari_ws_2010.pdf) and [www.icmet.ro/album\\_ws\\_2010/index.html](http://www.icmet.ro/album_ws_2010/index.html).

## Santa Clara

The IEEE Santa Clara Valley EMC Chapter held its second Mini-Symposium at the Doubletree Hotel on September 23–24. More than 50 attendees participated from companies such as Apple, Cisco and Lockheed Martin. This year 20 plus vendors exhibited which was a mixture of those that exhibited last year and new faces. The exhibit floor was filled with attendees, booth staff and volunteers whose total number was close to 100. The vendor exhibition was open just on the first day. In an effort to encourage the attendees to visit the booths, we created an "SCV EMC Passport" system where participants would get "stamps" for every booth they visited which then would qualify them to enter the raffle. The majority of the attendees stayed for the reception for a chance to win prizes such as a \$50 gift certificate for Home Depot provided by AR RF/Microwave Instrumentation and a \$50



*Professor Todd Hubing of Clemson University was the invited speaker for the Santa Clara Valley EMC Chapter's Mini-Symposium on September 23.*



*Eriko Yamato of TechDream, Inc. helped organize the Santa Clara Mini-Symposium and built excitement for the raffle during the reception.*



*Krassen Karagiosov played delightful music during the reception at the Santa Clara Mini-Symposium.*



*Professor Tom Jerse of The Citadel was the invited speaker for the Santa Clara Valley EMC Chapter's Mini-Symposium on September 24.*

gift certificate for Amazon provided by INCompliance Magazine. Dr. Hubing of Clemson University presented, "EMC Modeling and Design" and Dr. Jerse with the Citadel presented, "Radiated Immunity and Cosite Interference." Both lectures were very well received and attendees felt that there were many fruitful takeaways. The exhibitors were also very satisfied with the abundant opportunity they had to interface with the local engineers. With all the positive feedback both from the exhibitors and attendees, we believe the SCV EMC 2010 Mini-Symposium was a success and we plan to hold one again in 2011. On October 12, Dr. Richard Briët of Aerospace Corporation gave a presentation to the Santa Clara Valley Chapter entitled, "Spacecraft and Surface Charging Mitigation." Dr. Briët spoke about spacecraft and surface charging with an emphasis on practical applications of the current

state of the art of spacecraft charging mitigation. Dr. Briët also briefly discussed new developments in the use of surface charging as an enabling process to detect subsurface defects, and to use reverse engineering of current transients from electrostatic discharges as a means to locate the initiation points of ESD on solar panels. Dr. Briët earned his doctorate degree in Solid State Physics (Nuclear Magnetic Resonance and Plasma Physics) and Mathematics at the University of Utah in Salt Lake City, UT. After an exciting and challenging career in survivability, vulnerability, and endurance at Boeing, Military Aircraft Company in Wichita, KS, General Dynamics, Convair Division in San Diego, CA, and TRW, Redondo Beach, CA, Dr. Briët joined The Aerospace Corporation, an FFRDC (Federally Funded Research and Development Center) in El Segundo, CA, where he was assigned additional responsibilities in support of many commercial and non-commercial space programs. Through his many publications and presentations at national and international conferences in the USA, France, Germany, The Netherlands, United Kingdom, Taiwan, and Japan, Dr. Briët has become a widely recognized expert in plasma physics, electromagnetic effects, lightning, and space radiation effects.

design with regards to hybrid vehicles. The papers presented by these gentlemen were excellent. "Hybrid Electric Vehicle EMI Challenges" was taught by Dr. Gary L. Skibinski, a Fellow Engineer at Rockwell Automation Drives Division, who has been working on power electronics for 34 years. Dr. Skibinski taught how high voltage inverters and motors used in hybrid electric vehicles face similar but somewhat different EMC challenges as drive systems connected to the grid. A summary of recent work on how to obtain high frequency cable and high frequency motor models was presented to tie into mobile EMC. Discussion of shielding and bonding techniques was highlighted. Lastly, he covered simulation tools to study conducted noise that lead to radiated noise. "Battery Pack and Shielded Cable Considerations for HEV Bench Level EMC Testing" was taught by James P. Muccioli, an EMC consultant and owner of Jastech EMC Consulting LLC for the past 25 years. He has worked for X2Y Attenuators, Chrysler and United Technologies as Chief Technical Officer, EMC expert and System Engineer. He has taught EMC undergraduate courses and professional education seminars at Lawrence Technological University and at the University of Michigan. Mr. Muccioli's presentation examined the challenges for hybrid and electric vehicles (HEV), as engineers define their test specifications for the new high voltage/current technology. Competitive advantages as well as the cost for research and development were significant factors that he discussed. HEV battery pack and associated interfaces using system engineering to highlighted requirements, trade-offs and challenges that would correlate bench



*Dr. Richard Briët spoke to the Santa Clara Valley EMC Chapter on "Spacecraft and Surface Charging Mitigation."*

## SE Michigan

On May 20, 2010, Southeastern Michigan's EMCfest took participants back to school for the "EMC Aspects of Hybrid Vehicles and Motors" organized by Mark Steffka of GM and the University of Michigan. Dr. Gary Skibinski, James Muccioli, and Dr. David Johns regaled us with the basics of EMC engineering



*Speakers at Southeastern Michigan's EMC Fest in May are pictured, left to right: David Johns, Gary Skibinski, Mark Steffka, and James Muccioli. Thanks speakers for your hard work!*

level EMC testing to vehicle level testing were also discussed. "Simulation of Cable Interference and Emissions in Vehicle Power Systems" was covered by Dr. David P. Johns, the VP of Engineering and Support for CST of America. He received his Ph.D. in Electromagnetic Analysis from Nottingham University (UK) in 1996 for developing a new 3D frequency-domain TLM method. He contributed to the development of CST's 3D time-domain TLM code MICROSTRIPES and in particular efficient techniques for modeling current diffusion, apertures and wires. David has over 20 years of electromagnetic simulation experience and specializes in the modeling of real world EMC/EMI problems. He is a regular speaker at IEEE EMC conferences and Chapter meetings and recently the co-chair of the IEEE EMC Symposium Workshop, "How to Simplify Real-world Complex Systems into Realistic, Solvable, Accurate Models." The use of high voltage power systems in hybrid and electric vehicles adds to the already considerable challenges in meeting automotive EMC requirements. The switching associated with power converters or inverters can generate differential and common noise that propagates in cabling and interferes with other electronics systems. His presentation explored techniques for modeling the power system EMC problem and assessing interference between cables routed in close proximity. The effect of cable imbalance was discussed and also a comparison of shielded and unshielded cable coupling. On June 17, Arnie Nelson

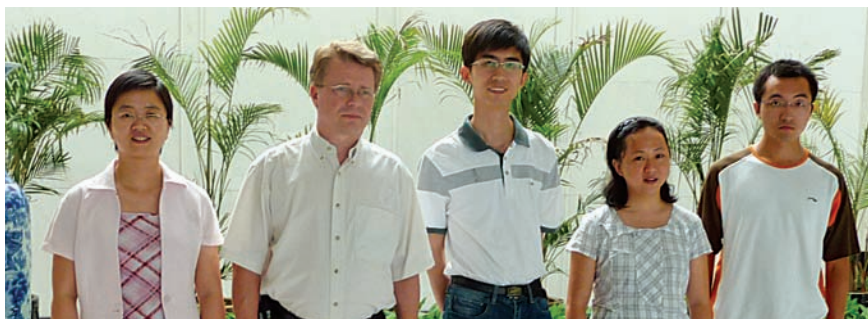
gave a great presentation on the "Basics of PCB Design" and working with component specifications for the Southeastern Michigan (SEM) EMC Society Chapter covering both the history and present day technology. Arnie retired from Visteon-Ford in 2005 with over 35 years experience in a number of disciplines. Since retiring, Mr. Nielsen has been active in consulting on electronic design and EMC for over 20 companies (including electric vehicles). In his presentation, Arnie described test anomalies that should be taken seriously and showed how Ford has been able to speed up the EMC test cycle by putting components under duress. Arnie discussed Ford's clattering relay as a great way to see how components deal with spurious signals across the frequency spectrum. Mr. Nielsen talked about Power Spectral Density (PSD) calculations and the effect of the PSD on testing decisions. He examined the different characteristics of diodes and those waveforms, his slides on this point were very illuminating and are on the SEM website. Arnie involved the group in considering ESD failures. Some ESD events cause components to become vulnerable to other stress that would not normally cause failure. So he emphasized the order of testing components. Arnie Nielsen's presentation was amazing; check out our website at [www.emcsociety.org](http://www.emcsociety.org) and look at past meetings to enjoy his slides. On August 19, 2010 Kimball Williams gave an insightful presentation on "Training an Automotive EMC Engineer." Kimball is the Senior Manager with Denso Internation-

al America in Southfield, MI, USA where he is the technical lead for the EMC test laboratory. Kimball has had many years of significant and influential experience in the EMC industry. Kimball explained that training and certification of EMC personnel to work in the automotive industry requires a unique and remarkably broad range of education, experience and talents. A great source of EMC personnel are HAM radio enthusiasts. Car enthusiasts who work with and have a deep understanding of their cars are another good source of EMC engineers. He explained the need for the new EMC engineers to understand the standards we test to and the importance of keeping abreast of the current technology with continuing education and networking with the EMC community. Kimball said the growth path for someone looking to make this avenue a career choice will likely take them into many areas where they originally had not planned to go. Those who assist the budding EMC engineer should expect to roll up their sleeves and get their hands dirty. On September 16, 2010, the Southeastern Michigan EMC Society was graced with a two hour presentation, "Engineering Aspects of PCB Level EMC Design" by Dr. Sergiu Radu, a distinguished lecturer of the IEEE EMC Society. He is currently Principal Engineer at Sun Microsystems, leading the EMC Design group in Menlo Park, California. He taught how to place traces to reduce crosstalk. Dr. Radu explained where the power supply should be located. He let us know how we should deal with partial or split ground planes. He gave examples of how spread spectrum could and has been used. Dr. Radu let us know where heatsink grounding should be placed in relation to other components. Ports and buses were also discussed. It was a great presentation and everyone was very impressed!

## Shanghai

Hongmei Fan reports that on August 28, 2010 at Unilab Co., Ltd, EMC professionals in Shanghai gathered to discuss the Chapter operation. Mr. Esa Korhonen, the IEEE EMC Shanghai Chapter Chair, welcomed two new members, Rong Wang and Yuan Hu. Topics regarding funding for the Chapter, membership issues, November EMC event, Chapter website and newsletter were discussed. Later the Chapter





*IEEE EMC Shanghai Chapter August event attendees included (from left) Hongmei Fan, Esa Korbonen, Yuan Hu, Rong Wan and Xin Zhang.*



*Mr. Esa Korbonen, the IEEE EMC Shanghai Chapter Chair, welcomed two new members.*

committee added a new volunteer, Yuan Hu as Website Administrator, apart from Esa as Chair, Hongmei Fan as Co-Chair and Weigang Chen as Secretary. The near future plan was made about contacting the IEEE Shanghai Section with the fund account, checking the active member list, getting new members, inviting professional speakers, building up a Chapter website and even publishing a Chapter newsletter. After the Chapter administrative discussion, Hongmei shared her experience in attending the past EMC Symposium in Fort Lauderdale. Funded by the EMC Society Financial Assistance Program,



*Dr. Hongmei Fan of Cisco Systems (China) Co., Ltd., locally presented her paper published in the Fort Lauderdale EMC symposium.*

Hongmei attended the symposium in July, attended the Chapter Officer Training, discussed a strategy to develop IEEE memberships in China, presented her paper and networked with EMC peers. In the Chapter meeting, Hongmei gave a brief introduction about the symposium and also presented her paper titled "Influence of Planar Sampling Techniques of Near Field Magnitude-only Data on Predicting Far Field Radiation of PCBs by Genetic Algorithms." The two-hour event ended with a tour of the Unilab testing facilities.

## Singapore

Richard Gao Xianke, Chapter Chair, reports that the Singapore Chapter was honored with the "2010 Best Chapter-of-the-Year" award by the IEEE EMC Society at the IEEE EMC Symposium held in Fort Lauderdale, Florida on July 29, 2010. Congratulations to all Chapter members! Thanks were expressed for everyone's great contribution and dedication. The consistent support from Chapter founders, Professor See Kye Yak and Dr. Er-Ping Li, and immediate past chair, Dr. En-Xiao Liu, is greatly appreciated. On August 2, 2010, Dr. Tony Centeno from Imperial College

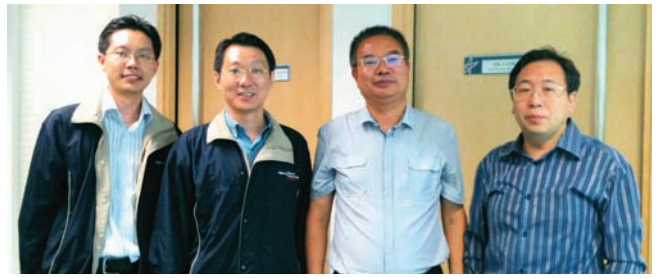


*Dr. Tony Centeno from Imperial College London, United Kingdom, gave a technical talk at the Institute of High Performance Computing of A\*STAR, Singapore, in August.*

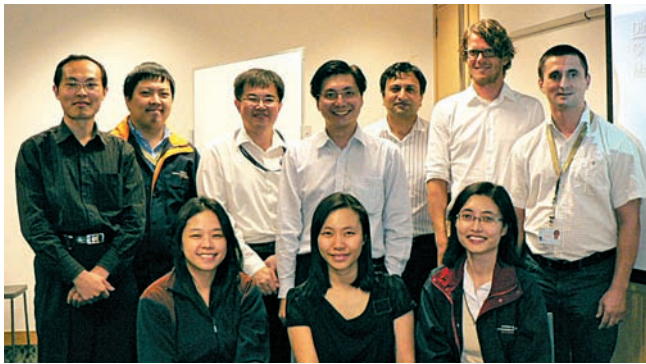
London, United Kingdom, delivered one technical talk entitled, "Localized Surface Plasmon Resonance: FDTD Modeling and Applications," followed by an ardent discussion during the Q&A session. There were a total of 22 attendees, of which 10 were IEEE members. In August, the Chapter invited Professor Wen-Yin Yan from Zhejiang University, China, who is also a Distinguished Lecturer of the EMC Society from 2011 to 2012, to deliver a series of technical talks entitled, "Multi-physics Modeling Techniques for Silicon-based Miniaturized Devices and High-density TSV Interconnects," "Development of Modeling Techniques for Carbon Nanotube-built Interconnects and Field Effect Transistors," and "EMP<sup>2</sup>—Electromagnetic Pulse and Electromagnetic Protection." On August 17, 2010, Mr. Elya B. Joffe, the immediate past president of the EMC Society, presented an excellent and interesting talk with the title of "Introduction of Leadership." It was well attended even though the seminar started at 6 pm. On August 24, 2010, Dr. Dirk Baumann from ETH Zurich, Switzerland, delivered one technical talk entitled, "Exploring New Optical Technologies to Improve Survival and Outcome in Stroke and Brain Injured Patients." There were a total of 29 attendees of which nine were IEEE members. On September 6, 2010, Mr. Thomas Kaufmann from ETH Zurich, Switzerland, delivered one technical talk entitled, "Meshless Method for Electromagnetic Computation." The seminar attracted 13 people, of which five were IEEE members. Associate Professor Ji Chen from the University of Houston, USA, delivered two technical talks on September 13, 2010, which were titled, "Time Domain Modeling Periodic Structures" and "Stochastic Analysis in Electromagnetics." There were a total of 24 attendees, of which 12 were IEEE members. Two days later, Professor Jin-Fa Lee from Ohio State University, USA, delivered a technical seminar entitled, "EM & CEM Research in OSU." There were a total of 17 attendees, of which eight were IEEE members. One of the major events in 2010 organized by the Singapore Chapter, "EMC Design Contest 2010", was held at Nanyang Technological University (NTU) on September 24, 2010. Professor See Kye Yak from NTU, who is also a committee member of the Chapter, chaired the half-day contest. Seven delegates were shortlisted for the final competition of which each delegate



*The participants listened attentively to Dr. Tony Centeno's seminar on August 2, 2010.*



*Professor Wen-Yan Yin (second from right) from Zhejiang University, China, delivered a series of technical talks at the Institute of High Performance Computing of A\*STAR, Singapore, from August 10 to September 2, 2010. From right to left are Professor Er-Ping Li, Professor Wen-Yan Yin, Dr. Richard Gao Xianke, and Mr. Phua Wee Kee.*



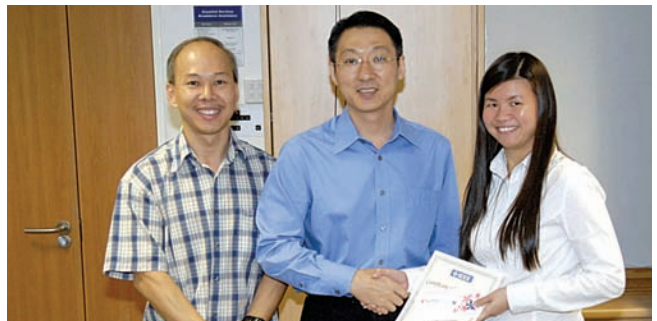
*The participants enjoyed photo taking with Dr. Dirk Baumann (second from right, back row) after the seminar on August 24, 2010.*



*The panel members of the EMC Design Contest included (from right to left) Dr. Deng Junbong, Dr. Wang Chao-Fu, Dr. Liu Enxiao, Dr. Richard Gao Xianke, and Dr. Chua Eng Kee.*



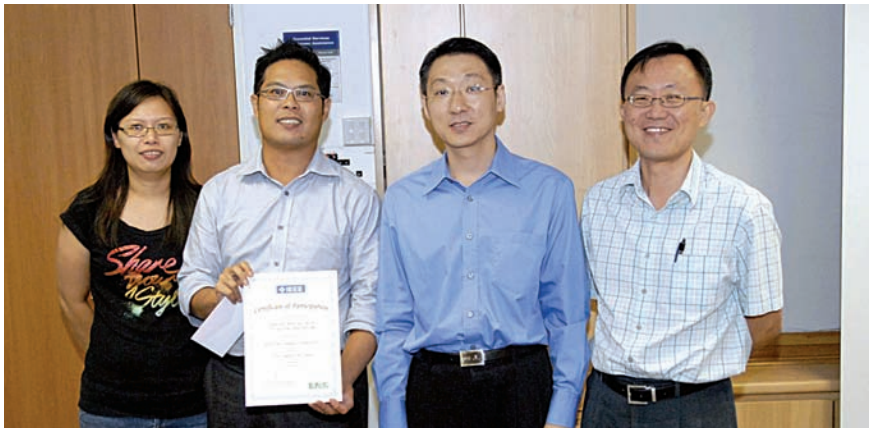
*Professor See Kye Yak from Nanyang Technological University, Singapore, chaired the EMC Design Contest organized by the Singapore Chapter on September 24, 2010.*



*The delegate from Nanyang Technological University received the certificate from Dr. Richard Gao Xianke (center), Chapter Chairman, at the EMC Design Contest.*



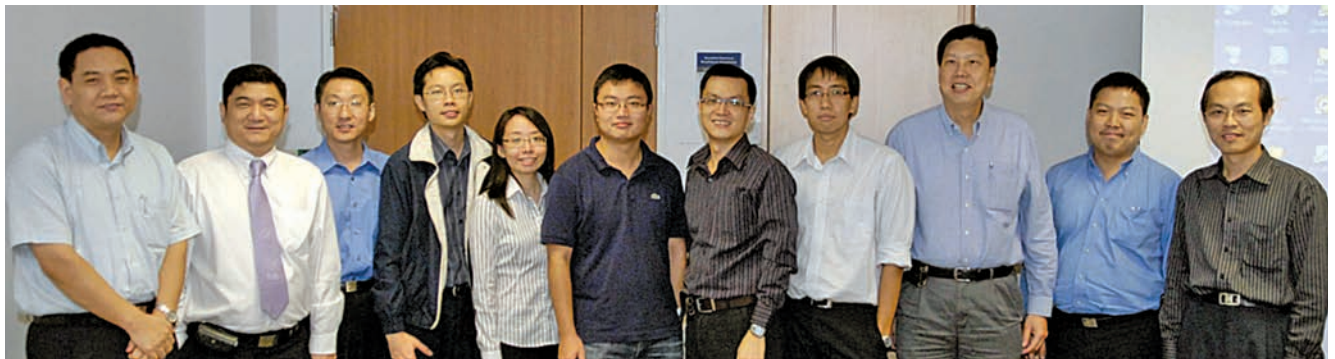
*The participants listened attentively at the EMC Design Contest.*



*The delegate from ST Electronics (Info-Comm) received the certificate from Dr. Richard Gao Xianke (center), Chapter Chairman, at the EMC Design Contest.*



*Dr. Eric Bogatin from Bogatin Enterprises, USA, delivered a technical talk at the Institute of High Performance Computing of A\*STAR, Singapore, on October 11, 2010.*



*The final winners of the EMC Design Contest enjoyed photo taking with panel members on August 24, 2010.*

would give a 20 minute presentation with five minutes Q&A. There were a total of 22 attendees, of which most were from industrial companies. This contest received a good response and the Chapter will continue to organize similar events in the future. After this contest, Dr. Richard Gao Xianke, Chapter Chairman, hosted the third administrative meeting and updated the activities organized by the Chapter. Dr. Chua Eng Kee, Chapter Treasurer, updated the financial report for the first three quarters of 2010. The commit-

tee passionately discussed the work plan for the fourth quarter of 2010 and the year of 2011, which includes organizing technical seminars and distinguished lectures, short courses, membership development, social activities for Chapter members, best student paper contest, etc. The candidates for the four key positions on the Chapter committee for 2011 were also nominated during the meeting. On October 11, 2010, Dr. Eric Bogatin from Bogatin Enterprises, USA, delivered an excellent technical talk entitled, "Controlling Loss

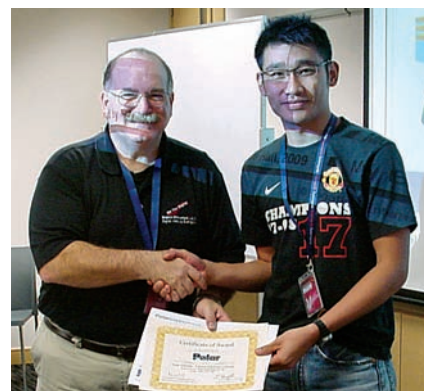
in Transmission Lines: The New Challenge for Circuit Board Design and Fabrication." The seminar was well attended with a total of 47 participants, of which most were from industrial companies.

## Sweden

In October, the Swedish Chapter had a little celebration of 20 years of activity. The first meeting took place in Linköping at FOA3, now FOI Swedish Defense Research Agency, on October 17, 1990. Eight members and eleven non members participated. Meeting #55 was also held in Linköping on October 5, 2010, but this time at Combitech, which sponsored



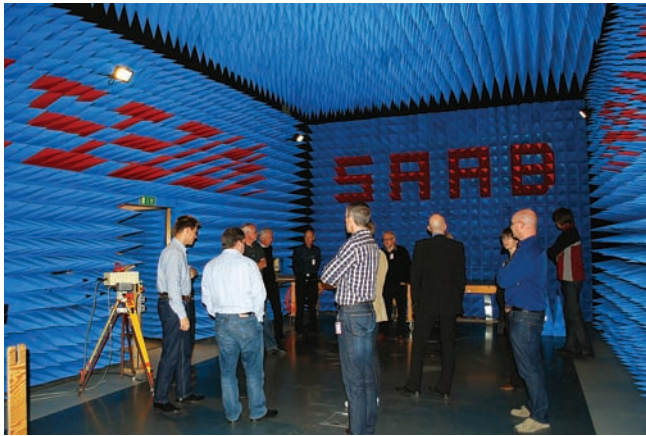
*Dr. Eric Bogatin did a lucky draw after his seminar and presented his book as a gift prize to Mr. Timothy Foo.*



*The second gift prize, a Polar EM simulation toolkit, was presented by Dr. Eric Bogatin to the winner.*



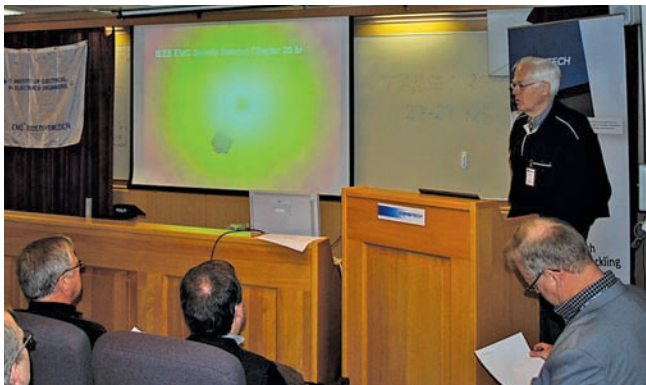
*Chairman Jan-Olof Brink opens the Sweden Chapter's 20 Year Anniversary meeting.*



*The Combitech's EMC Test Facility, which hosted the October meeting of the Sweden Chapter.*



*Members of the Sweden Chapter enjoy the evening social after a day of Chapter business and technical presentations.*



*Founding father of the Sweden Chapter: Peter Landgren (far right).*



*Mats Bäckström of Combitech was the gracious host of Sweden's 20 year anniversary meeting.*



*Managing Director Marie Bredberg of Combitech welcomed everyone to the meeting.*



*Sweden Chapter members enjoy a tour of the mode stirred chamber at Combitech.*

the social activity on the preceding evening. Some 50 EMC engineers attended this meeting. When the Chapter started 20 years ago, there were about 30 IEEE EMC members and now there are more than 100! With 55 meetings held in 20 years, we have 2.8 meetings per year on average, which is close to what we had hoped for in the beginning. Six of the participants in the first meeting also

visited this meeting, indicating a long term commitment to EMC. The meeting was a joint activity with SNRV, section E, which is the Swedish branch of URSI. During the social activity, the managing director of Combitech, Marie Bredberg, gave a short presentation about the company. The program started with a formal planning session with election of the local board and planning for the upcoming

meetings, followed by information from the participants. This time we had a history part of the meeting. Peter Landgren presented a short paper with the title "20 år sedan första mötet inom IEEE/EMC; hur det hela började", which translates to "20 Years Since the First Meeting with IEEE/EMC; How it All Began." He had managed to get a copy of the petition from IEEE HQ. Of the 13 petitioners,



*Attendees of Sweden's 20 year anniversary meeting enjoy a technical presentation.*

four are still in the EMC business. Most of the others are retired. The next paper "Presentation of Combitech" was given by Per Hagström, local manager of the EMC test facility at Combitech. This presentation was followed by another entitled, "Intentional EMI – An Overview". This talk was given by Mats Bäckström of Combitech. Mats was also the host for this meeting. One more paper was given before lunch: "Radiated Front Door Interference in Future Railway Systems (ERTMS)" by Daniel Månsson, High Voltage Valley and KTH, Royal Institute of Technology. After the morning presentation, the attendees enjoyed lunch and a visit to Combitech's EMC test facility. Before the afternoon coffee break, Magnus Olofsson, Director General of the Swedish National Electrical Safety Board, talked about "EM-threat from an Authority View." After the break, Mikael Alexandersson from FOI, discussed "Interference of GPS – Threat and Vulnerability Tests" and Magnus Höijer, also from FOI, talked about "The Vulnerability of Electronic Equipment – the



*Speaker Sergiu Radu (left) receives thanks from Dave Britton following an excellent Distinguished Lecturer presentation at the October Oregon and SW Washington Chapter meeting.*

Most Important Parameters." The meeting was closed by our Chairman, Jan-Olof Brink, who thanked the host Mats Bäckström and his secretary, Therese Nilsson, for a very well organized meeting.

### **Oregon and SW Washington**

Alee Langford, Chapter Vice-Chair, reports that the Oregon and SW Washington Chapter had the pleasure of having their own Chapter Chair, Mark Briggs of Elliott Laboratories, present at the September meeting. The topic was R&TTE Directive: Wireless Modules and Multi-Function Equipment. The meeting was well attended and valuable information was presented. In October, the Chapter welcomed Sergiu Radu, Ph.D., IEEE



*Mark Briggs, Chapter Chair of the Oregon and SW Washington EMC Chapter, was the featured speaker at the September meeting.*



*Oregon and SW Washington Chapter officers, including Alee Langford, Henry Benitez, Mark Briggs and Sidney Chan (from left) meet over a nice lunch to plan upcoming Chapter meetings.*

EMC Society Distinguished Lecturer. He discussed engineering aspects of PCB level EMC design. With his extensive knowledge and background, he was able to offer information and suggestions useful to engineers during their design stage. The last meeting of the year will be in November with speaker Bob Scully of NASA. The topic has not been determined; however, this is a highly anticipated meeting, and the Chapter is excited to welcome him to the Pacific Northwest. The Chapter will end the year with their annual Christmas social at "Who Song and Larry's" on the Columbia River as they enjoy the parade of Christmas ships. Visit the Chapter website for more information <http://ewh.ieee.org/r6/oregon/emc/>.



*John Maas (far left) of IBM Corporation with Dan and Brodie at the Twin Cities, Minnesota meeting.*



*Speaker Dan Hoolihan (left) from Hoolihan EMC Consulting with Minnesota IEEE EMC Chapter President Brodie Pedersen from Nonin Medical.*

### **Twin Cities (Minnesota)**

The 2010 Minnesota EMC Event was held on Friday, September 17, 2010 at the Ramada Mall of America in Bloomington, Minnesota. The activities at the event included three technical tracks, EMC exhibits by experienced EMC vendors and fabulous prizes which were awarded at the end of the day. The Technical Tracks included notable EMC professionals presenting in their respective area of expertise with topics related to Military EMC, Medical EMC, EMC Testing Labs, EMC Design and EMC

standards. After the event was concluded, the local IEEE EMC Chapter meeting was held and included a great presentation by the Chairman of the

EMC Society's History Committee, Daniel Hoolihan. His topic was "25 Years of the Twin Cities EMC Chapter – a Historical Review." **EMC**

### **Congratulations Jim!**



PHOTO BY JANET O'NEIL

*Jim Blaba, Chair of the Milwaukee EMC Chapter, and his wife Mary Ellen enjoy the Gala event during EMC 2010 in Fort Lauderdale. Following the Symposium, Jim was recognized by the IEEE Member Geographic Activities (MGA) Board as the 2010 recipient of the MGA Achievement Award. Jim was nominated by the IEEE Milwaukee Section for this very prestigious award to recognize "his vision, leadership, and commitment in assisting the professional development of IEEE members by organizing the Electromagnetic Compatibility (EMC) seminars in Milwaukee from 2001 to 2010."*