Chapter Chatter

Dennis Lewis, Associate Editor

I hope everyone is as excited as I am about EMC/SIPI 2018 in Long Beach. Looking back to 2011, when the IEEE EMC Symposium was last held in Long Beach, I remember the great technical program, welcome reception, Wednesday night gala on the Queen Mary and most of all the sunshine! I'm looking forward to catching up with colleagues, sharing some knowledge and seeing what's new in our industry. With all the hype about IoT, 5G and autonomous vehicles, it's sure to be an exciting year. For all the new Chapter Chairs, don't forget to make time to attend the Chapter Chair training session and for those old timers, it's a chance to share what has worked well at your Chapter events.

Hope to see you all in Long Beach!

Germany

The IEEE German EMC Chapter held a meeting during the EMC Congress and Trade Fair in Düsseldorf. On February 21 during the "EMV Düsseldorf" conference, members of the IEEE German EMC Chapter as well as interested guests met in the city hall of the exhibition center in Düsseldorf. After a brief welcome message from the Chapter chairs (C. Schuster and M. Tröscher), Sven Battermann briefly introduced the board members as well as the activities planned for 2018. Particularly noteworthy is the third EMC Boot Camp, which will take place in Dresden in October 2018.

Stefan Dickmann and Matthias Magdowski presented the task of the "2017 IEEE EMC Student Contest" and honored the winning teams (see details on next page). David Hamann outlined the task for the "2018 IEEE EMC Student Contest", which deals with the design of a AC/DC converter. The detailed call is now published on the Chapter site: http://sites.ieee.org/germany-emc/research/student-contests/. Lecturers at universities and colleges are encouraged to promote this student contest, e.g. in EMC lectures, lab exercises or student projects.

In a technical lecture entitled "Hardware Demonstrations for Understanding and Teaching Inductance", speaker Lee Hill presented suggestions on how to convey the concept of inductance with the help of simple experimental arrangements.

Following the official agenda, Chapter members and guests had a great opportunity for professional and personal exchange, in the lecture room as well as at the EMC Society booth.

As mentioned above, winners of the 2017 IEEE EMC Student Contest were honored during EMV Düsseldorf. The task for the 2017 IEEE EMC Student Contest of the Germany EMC Chapter was to build an equivalent circuit diagram of an EMI filter as found in typical household appliances. Only photographs of the PCB and measured data of various frequency responses were given. Student teams had to send in their simulations model and a short report. The jury chose two best evaluated submissions: The 2017 EMC Student Contest Winner Award was presented to Janine Ebersberger, Duc Nguyen and Stephanos Papakonstantinou from the Leibniz University of Hanover. It was also a pleasure to present the 2017 EMC Student Contest Runner Up Award to Martin Benjak, Dominic Pfeiffer and Martin Burchard (from the Leibniz University of Hanover as well). All other submissions that were also evalulated on a high technical level were rewarded with a certificate of merit. The original task description and the reports of the student teams are available for download at the Chapter web site: http://sites.ieee.org/germany-emc/research/student-contests/

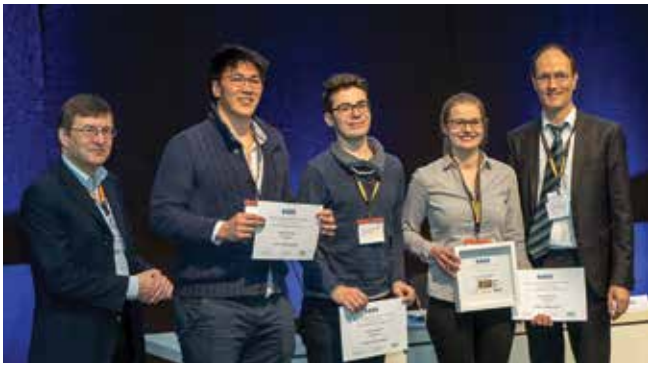
During the German Microwave Conference (GeMiC) 2018 held during March 12-14, 2018 in Freiburg, Germany, an IEEE EMC workshop was organized in cooperation with the IEEE Germany Section Electromagnetic Compatibility Society Chapter. The focus of this workshop was on "Emerging Topics in Automotive Microwave and EMC Engineering", in particular on antenna related subjects. With the ever increasing number of antenna systems in the automobile, inter-

German EMC Chapter Chair Christian Schuster welcomes the attendees to the IEEE EMC Chapter meeting in February.

The IEEE EMC Society booth at the "EMV Düsseldorf" conference was staffed by German EMC Chapter members K. Schubert, S. Fisahn, and D. Hamann (from left).

David Hamann (left) presented details about the 2018 IEEE EMC Student Contest of the German EMC Chapter.

Speaker Lee Hill of SILENT is shown presented "Hardware Demonstrations for Understanding and Teaching Inductance" at the German EMC Chapter meeting.



The 2017 IEEE EMC Student Contest Award was presented by Stefan Dickmann (far left) and Mathias Magdowski (far right) to the award winners Duc Nguyen, Stephanos Papakonstantinou, and Janine Ebersberger from the Leibniz University of Hanover.

The 2017 IEEE EMC Student Contest Runner-Up Award was presented to the team of Martin Benjak (second from left), Dominic Pfeiffer (second from right), and Martin Burchard (not pictured).

system and intra-system coupling and RF interference become more important and require closer cooperation between MW/RF and EMC engineers. Technical presentations were given by Thomas Eibert (TU Munich), Matthias Tröscher (CST – Computer Simulation Technology GmbH), Christoph Wagner (Rohde & Schwarz) and Saeed Milady (NXP Semiconductors Germany GmbH). Some 30 attendees participated in this workshop and had lively technical discussions afterwards.

Melbourne

A paper written by former IEEE EMC Chapter Chair and Senior IEEE member in Melbourne, Florida, Woody Hawthorne was recently accepted for a presentation at the upcoming 2018 IEEE Symposium on Electromagnetic Compatibility, Signal and Power Integrity (EMC + SIPI 2018) to be held in Long Beach, CA July 30 to August 3, 2018. The title of the paper is "Protecting Your Reputation" and addresses proven approaches on how to retain and preserve your professional reputation when faced with challenges from outside parties.

Milwaukee

With the snow piling up outside on March 6, 2018, the March EMC Seminar in Milwaukee was heating up indoors. This year's EMC Seminar speaker was Daniel Beeker of NXP Semiconductors. (Check out Dan's photo and his basket of smelt – his enthusiasm was nonstop all day long

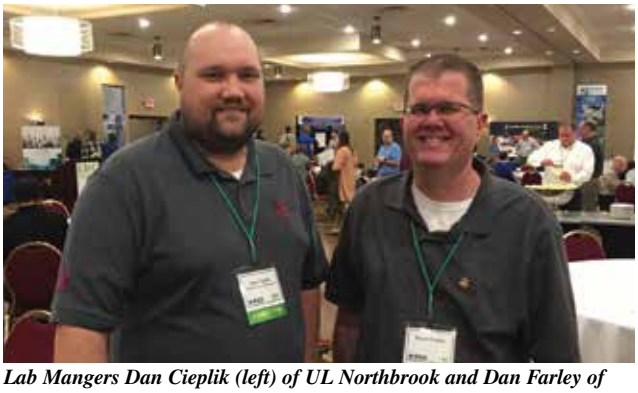
The team that assembled 140 tutorial binders for the 17th Annual EMC Seminar in Milwaukee, Wisconsin with speaker Dan Beeker of NXP Semiconductors.

A full house of 140 people listened to presentations on "How Electromagnetic Fields Behave on Circuit Boards", "Power Distribution Made Easy" and "PCB Design to Survive Transients."

IEEE colors were flying high as centerpieces on the luncheon tables.

Jim Blaha received an IEEE Achievement Award for chairing 17 years of EMC Seminars in Milwaukee that educated over 2,400 engineers.

Jim Blaha and Tess Wolbach of TecRep are shown having fun with cables. Over 38 exhibitors participated in the Milwaukee EMC Seminar.



Lab Mangers Dan Cieplik (left) of UL Northbrook and Dan Farley of GE Healthcare Waukeshav reconnected during the EMC Seminar.

Jim Blaha and Marie Smith of NTS Chicago enjoyed the full day of outstanding EMC education in Milwaukee.

Marybeth Kupsche (left) and Robin Soukup of Element 14 are shown handing Jim Blaha a loin cloth.

Mary Ellen Blaha and Randy Johnson of Ametek were happy to be back together again at the Milwaukee EMC Seminar.

(From left) Teong Lim of Briggs and Stratton visited with Ron Zimmerman and Brad Shell of International Compliance EMC Lab during the Milwaukee EMC Seminar.

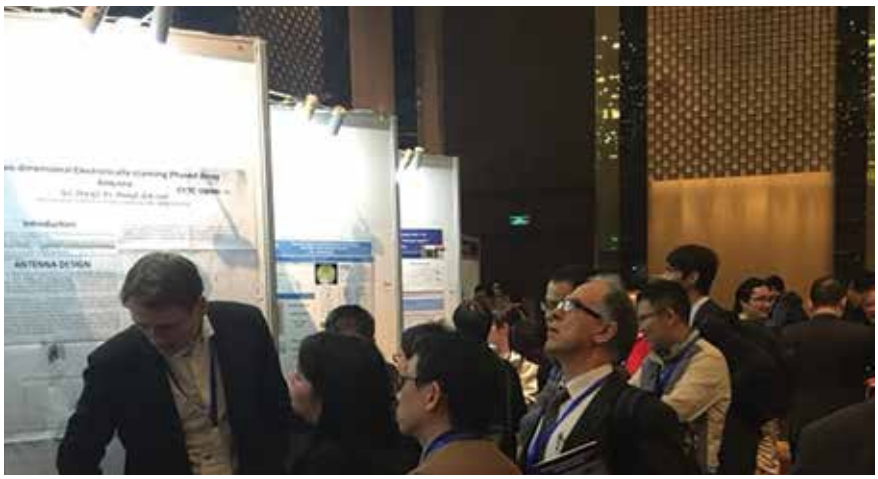
The 2018 EMC Seminar Committee were pleased with yet another successful EMC Seminar on March 6.

Speaker Dan Beeker enjoyed a basket of smelt along with his new cheese head at the conclusion of the Milwaukee EMC Seminar.

and into the evening.) During the daylong seminar, Dan's four lectures provided eight hours of Continuing Educational Units for PE's in Wisconsin and Illinois. Topics included "How Electromagnetic Fields Behave on Circuit Boards", "Power Distribution Made Easy" and "PCB Design to Survive Transients".

This year's EMC Seminar was the 17th in a series held every spring by the Milwaukee EMC Chapter. With this year's attendance of 145 engineers, our total for the past 17 years now exceeds 2,400 engineers. With that number, consider the outreach and impact the IEEE EMC Society has had on the engineering community in Southeast Wisconsin. In addition, 38 exhibitors of EMC test products and services also attended. Collectively, over 230 people were in attendance.

As with previous Chapter Chatter articles from Milwaukee, enjoy the photos.



Some 170 delegates from over 20 different countries registered to attend iWAT 2018 in Nanjing. In addition to two plenary talks and 41 invited talks, nine oral sessions and three poster sessions were arranged during the conference.

Nanjing

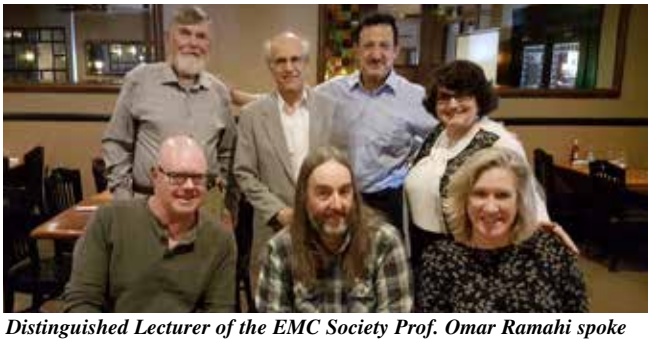
The Joint Nanjing Chapter technically cosponsored the 14th IEEE International Workshop on Antenna Technology (iWAT 2018) held on March 4 to 7, 2018, in Nanjing, China. There were 96 papers accepted from a total of 127 submissions received, and around 170 delegates from over 20 different countries registered to attend iWAT 2018. In addition to two plenary talks and 41 invited talks, nine oral sessions and three poster sessions were arranged during the conference. Six papers were awarded the "Best Student Paper" and two papers received the "Best Poster Paper Award."

The Joint Nanjing Chapter technically cosponsored the 14th IEEE International Workshop on Antenna Technology (iWAT 2018) held in Nanjing, China. Committee members and Raj Mittra (center in pink shirt) enjoyed the banquet held during the workshop.

Denis Sabatier of ClearSky in France presented at the Rail Technology Forum on CBTC in two parts (Formal Methods and System Level Proof) on April 12 for the New Jersey Coast Chapter.

The audience at the New Jersey Coast meeting consisted of engineers working on CBTC (NY City Transit) and academic faculty.

Denis Sabatier speaks about the formal proof methods for CBTC (part 2 of his talk) to a rapt audience.



Distinguished Lecturer of the EMC Society Prof. Omar Ramahi spoke on "What Causes Radiation" at the New Jersey Coast Chapter meeting on April 21. Seated from left are Eamon Wall, Thomas Willis, and Margaret Lyons. Standing from left are Donald Aves, Manu Malek, Omar Ramahi, and Filomena Citarella.

New Jersey Coast

The EMC/AP/VY Joint Chapter of the IEEE Coastal New Jersey Section had an excellent year so far (April 2018) with multiple technical activities in the area. The officers for the Chapter this year include:

K. Raghunandan, Chair, raghunandan@ieee.org
Katherine August, Vice Chair, kit@ieee.org
Neerja Sharma, Neerjasharma@ieee.org
Filomena Citarella, Secretary, fcitarella@ieee.org

The following technical talks were organized and successfully supported by the New Jersey Coast Chapter.

Conference /Tutorial / Talk	Name	Speakers	Location / Date	Attendees	Nature of support from Chapter
Technical Talk	TETRA (Communications Technology) for Mission Critical Solutions	**Victor Hernández, PowerTrunk Inc. Spain**	March 21, 2018, 5pm Location: Con Edison, Edison Room, 4 Irving Place, NY 10003 New York,	48 (both members and nonmembers)	Three Chapters Co-sponsored the conference. IEEE PES & IAS NY Chapter and the NY LMAG and the IEEE NJ Coast AP/EMC/VT Chapter
Rail Technology Forum	CBTC for Rail System 1.Formal methods of design verification 2. System level Formal Proof	Denis Sabatier, ClearSky, France	April 12, 2018 Location: WPS, C2HM office, 22 Cortlandt St. 31st floor, New York, NY 10007	30 (both members of industry and academic faculty)	Jointly sponsored by the Vehicular Technology Chapter, NY and AP/EMC/ VT Chapter NJ coast.
Tutorial	"What Causes Radiation"	Distinguished speaker of EMC Society Prof. Omar Ramahi, University of Waterloo	April 21, 12 -2 pm. Location: Meloney Grill, Matawan, NJ	6 (Members of IEEE)	Main sponsor of the event AP/EMC/VT Chapter
Tutorial	Wireless communications for emergency situations (new topic)	Distinguished speaker of VTS Society Prof. **Dr Yi Qian, University of Nebraska**	April 26, 7-9 pm. Location: Meloney Grill, Matawan, NJ	22 (Members of IEEE)	Main sponsor of the event AP/EMC/VT Chapter

Phoenix

Our first meeting of 2018 was held at Compliance Testing Labs in Mesa Arizona on Wednesday, February 21. The evening began at 5:30 pm with the customary social hour and an excellent BBQ dinner from Gilbert's "Joe's BBQ". The meeting itself began at 6:45, with Glen Gassaway (our Chapter chair) discussing Chapter business. Glen talked about the upcoming 2018 IEEE EMC Symposium in Long Beach, our Chapter's corporate sponsorship program and the Chapter's job board. We then had our officer elections. Glen thanked our outgoing 2016-2017 officers: Brett Gas-

Phoenix EMC Chapter members socialized before the February 21 Chapter meeting at Compliance Testing Labs in Mesa, Arizona.

Bill Blanford (left) and Daryl Gerke chatted after the February Phoenix EMC Chapter meeting.

Bill Limburg of Limburg Electro-Optics gave a presentation on "Demystifying EMI Filters" at the February Phoenix EMC Chapter meeting.

The Compliance Testing Labs crew were on hand to help out with arrangements at the February Chapter meeting.

David Sangston (left) and Zach Schimke of Artesyn exchanged ideas after Bill Limburg's presentation.

Phoenix EMC Chapter members review business before the March Chapter meeting.

A round of introductions was made to start the program for the Phoenix EMC Chapter meeting on March 20.

Bill Wangard of Rohde & Schwarz USA was the featured speaker at the March meeting of the Phoenix EMC Chapter.

Bill Wangard presented "EMC Receiver Concepts" as a lecture with a demo at the Phoenix EMC Chapter meeting in March.

The Phoenix EMC Chapter Chair Glen Gassaway (right) presented an Arizona coffee mug as a thank you gift to speaker Bill Wangard.

saway (vice-chair), Amanda Reed (treasurer) and Greg Wilkins (secretary) for a job well done! After a spirited election, we are proud to announce that we will have three new officers for 2018-2020: Chris Williams of ViaSat (vice-chair), Bob Windell, formerly of Honeywell (secretary) and Cheryl Checketts of Estatic (treasurer). Glen will continue as the Chapter chair and Daryl Gerke will continue to be our Chapter "Godfather".

Glen then introduced our featured speaker, Bill Limburg of Limburg Electro-Optics. Bill has over 40 years of experience as an independent consultant in the EMC and electro-optical fields. His presentation was titled: "Demystifying EMI Filter Design." Bill defined EMI filters into two major classes, power line filters and signal conditioning filters. He mentioned that EMI filters must operate over several decades of frequency and provide substantial attenuation of electrical noise without perturbing the intended signal or power. Power line filters may be one or two-stage and are often comprised of at least one pair of differential mode series inductors and at least one differential mode capacitor. A power line EMI filter should also have a common modem (CM) stage, consisting of two or more line-to-chassis capacitors and a common-mode inductor. The CM inductor is located at the input end of the filter to maximize the impedance of the "outside" loop.

Steps for designing a power line filter include calculation or measurement of the differential and common mode noise currents as a function of frequency, comparing the emission limit to the expected noise current amplitudes as a function of frequency and determine the required attenuation the filter must have. One can then formulate the overall topology and component values for the filter, design the differential mode and common mode inductors. Finally, one can lay out the physical design and packaging of the filter. Both differential and common mode inductors must be capable of maintaining the desired minimum inductance up to the peak current at the power frequency under the maximum load. The magnetic material chosen for the core must have acceptable permeability up to the maximum frequency needed for useable inductance, and the inductor winding must have low resistance to minimize power loss.

Common mode inductors are usually multi-winding inductors, designed to have a high inductance, high self-resonant frequency and low winding resistance at DC or the power frequency. They achieve these characteristics by being designed so that the magnetic flux due to the power current is cancelled by the opposing equal power currents in the two (or more) identical windings. Cancellation of the magnetic flux at DC or low frequencies in the core of a common mode inductor allows the use of a relatively high permeability magnetic material. This enables use of a small number of turns in each winding, thereby lowering the distributed capacity and raising the self-resonant frequency.

In terms of installation, Bill pointed out that the most important single requirement for the installation of a power line filter is to make sure that the filter ground bus is electrically bonded to the system structure via a very low impedance path. This path must maintain its low impedance up to the highest frequency which the filter must attenuate, and the filter should be located as close as possible to the point at which the power lines enter the system.

Signal and control EMI filters may be feed thru capacitors, feed thru filters, filter-pin connectors, ferrite sleeves, or even optical isolators or fiber optic links if required. Filter pin connectors are indispensable when fixing EMC design problems when the system is already designed and in production or when retrofitting systems already in use due to new requirements or unforeseen environmental conditions.

After the talk, Glen Gassaway thanked Bill for his fine presentation! The meeting was closed at 8:30 pm. We are grateful to Compliance Labs in Mesa, Arizona for hosting and providing their facilities for this event.

The second meeting of 2018 of the Phoenix IEEE EMC Chapter was on Thursday, March 20, 2018 at Compliance Testing Labs. The Chapter thanks them for providing their conference room and facilities for this event. The meeting was attended by more than 30 members/guests with a very cordial social hour commencing at 5:30 pm. Dinner was a wonderful Mexican buffet with drinks of choice and lots of pleasant conversion as old and new members had a chance to catch up on what was new since the last meeting. Guests were joining in the table conversations as well.

The meeting began with some announcements from our Chapter chairman, Glen Gassaway. He went over IEEE business including discussion on the benefits of IEEE membership for those who have not yet joined. Also discussed was the upcoming IEEE EMC Symposium to be held in Long Beach, California from July 30 to August 3, 2018. Symposium brochures were handed

Speaker Darryl Ray (center, at computer) prepares for his presentation at the December 2017 meeting of the Santa Clara Valley EMC Chapter.

Darryl Ray presented "Medical EMC Review of IEC 60601-1-2 – 4th Edition and IEC TR 60601-4-2 - 1st Edition" at 7layers in Sunnyvale, California.

out to the members and guests that provided all the information necessary to register. A reminder was also made to the attendees to sign the attendance sheet as this is the best way of keeping up with local contacts and interested guests. Introductions were then made by all of the attendees, a wonderful approach to getting information on work availability/needs.

After Glen concluded the business end of the meeting he introduced the guest speaker for the evening, Bill Wangard. Bill Wangard is the EMC receiver, broadband amplifier, and EMC software product manager at Rohde & Schwarz USA. He took an active role in working with the Tri-Services Working Group to implement FFT based Time Domain Scan within MIL-STD-461G. Bill has 20+ years of RF and receiver design experience with Motorola and Rohde & Schwarz USA where he authored numerous white papers and patents. Bill's topic for the evening was "EMC Receiver Concepts." A copy of the presentation was provided to the group through Glen. The topics discussed included:

1. What Does Compliance Mean
   a. CISPR 16-1-1, providing specifications for measurement apparatus
   b. CISPR 16-2-1, spectrum analyzers vs. measurement receivers
   c. Measurement times and methods for automated measurements
2. Spectrum/Signal Analyzer Architecture
   a. Purpose/Application
   b. Architecture
3. The Value of Preselection
4. Time Domain Scans
   a. Ability to Capture Intermittent Signals
   b. Speed
   c. Measurement Time (Dwell Time) / PRI (Pulse Repetition Rate)
5. AGC: Automatic Gain (of Level) Control
6. User Interface
7. Real-time Spectrum Analysis

This presentation was very well received and provided an in-depth look at how to approach EMI measurements based on the equipment type and to how to ensure that the measurements are valid and meaningful. The discussion on time domain measurements was most appreciated and useful. As always, a big thank you to Glen and the rest of the Chapter staff for a meeting well received by all in attendance.

Santa Clara Valley

On December 12, 2017 the Chapter featured "Medical EMC Review of IEC 60601-1-2 – 4th Edition and IEC TR 60601-4-2 - 1st Edition" by speaker Darryl Ray. His presentation touched on the challenges dealing with EMC compliance on medical electrical equipment and systems. IEC 60601-1-2 Edition 4 will soon be mandatory, and this means dramatic changes for the medical electronics industry. The topics he presented included the relationship of IEC 60601-1-2 with other standards; the motivation and philosophy of the 4th Edition; what is "essential performance" and "Basic Safety"; a comparison of the 3rd and 4th Edition requirements; an in depth review of IEC 60601-1-2, 4th Edition; labeling and documentation requirements; risk management for EMC; and IEC TR 60601-4-2 (EMC performance).

On Tuesday, February 13, 2018, Sangam Baligar of AR RF/Microwave Instrumentation, presented, "Future of EMC Testing in Components, IoT and Automotive Industry". The meeting was held at 7layers in Sunnyvale, California. Sangam asked the audience, "Can you imagine the world without electronic devices?" He went on to explain that today's electronic gadgets, machines and appliances have become an integral part of our lives. The more electronic devices that these technologies (e.g. 5G & IoT) interact and co-exist with, the greater the potential for disturbance (RF interference) among them. The largest challenge for these emerging applications will be RF compliance, not only with regard to regulatory requirements, but also there will be greater emphasis on operational environments to ensure proper performance, and public safety. These emerging technologies will continue to grow and influence the commercial, automotive, and defense industries through 2020. This presentation discussed new product features and methodology requiring greater awareness of the EMC environment in which they operate, and new test approaches.

On Tuesday, March 6, the Santa Clara Valley EMC Chapter held a meeting while the ISO/CISPR D global automotive EMC experts were in town for their committee meetings hosted by Analog Devices in Milpitas, California. The Chapter meeting was held nearby at Siemic, also in Milpitas. The meeting drew a record 72 attendees for the topic: "Antenna and EMC Measurement Test Challenges of Autonomous Vehicles." The speakers addressed the latest test methods and standards development impacting the future of the automotive industry. Following an excellent Mediterranean dinner buffet

Santa Clara Valley Chapter officers Caroline Chan (left) and Giuseppe Selli (right) presented a certificate of appreciation to speaker Sangam Baligar following the meeting.

Over 70 attendees gathered at Siemic in Milpitas, California for the March 6 meeting of the Santa Clara EMC Chapter.

Santa Clara Valley Chapter Vice-Chair Caroline Chan presented a certificate of appreciation to speaker Darryl Ray following his presentation.

Sangam Baligar of AR RF/Microwave Instrumentation, presented, "Future of EMC Testing in Components, IoT and Automotive Industry" at the February Chapter meeting.

sponsored by Siemic/Bureau Veritas and ETS-Lindgren, attendees were welcomed by host Ron Hsu of Siemic who provided an overview of Bureau Veritas and their global services. Next, Craig Fanning of Elite Electronic Engineering, presented an "Overview on ISO/CISPR D Automotive EMC Committee Activity." He explained that over 50 automotive EMC experts from the Americas, Europe and Asia participate on the ISO/CISPR automotive EMC standards committees. The experts represent manufacturers of automotive vehicles and components as well test and instrumentation suppliers. They are responsible for writing the standards that verify the performance and quality of products manufactured in the automotive industry. As chair of the CISPR D working group 2 committee, Craig provided a brief overview on how these committees and working groups operate, the significant standards currently under revision, and future activity related to today's modern vehicles. Garth D'Abreu of ETS-Lindgren next presented, "Vehicle Level Antenna Pattern and Advanced Driver Assistance Systems (ADAS) Measurement." Garth explained that in the rapidly evolving industry of

Santa Clara EMC Chapter members, Jeff Evans of Intel, Fermin Romero of Intel, Nancy Zheng of Siemic and Clive Bax of Bureau Veritas, along with Chapter Chair Giuseppe Selli (from left) enjoyed catching up at the meeting.

It was a full house on March 6 at Siemic for a special meeting on the topic "Antenna and EMC Measurement Test Challenges of Autonomous Vehicles."

The meeting featured an "Ask the Experts" panel with (from left) Rob Kado of Fiat Chrysler Automobiles, Don Seyerle of General Motors, and Keith Frazier of Ford. Craig Fanning (far left) of Elite Electronic Engineering moderated the panel.

The automotive experts were in town for the ISO/CISPR D automotive EMC committee meetings. The Santa Clara Chapter appreciated Don Seyerle, Keith Frazier, Garth D'Abreu of ETS-Lindgren and Rob Kado (from left) lending their time and talent!

autonomous vehicles, the ability to successfully provide vehicle level antenna pattern and ADAS measurements will be key to the future of this market and address public safety concerns. His presentation detailed the essential aspects of the market demands and how innovative testing solutions help drive the technologies forward to real-life applications.

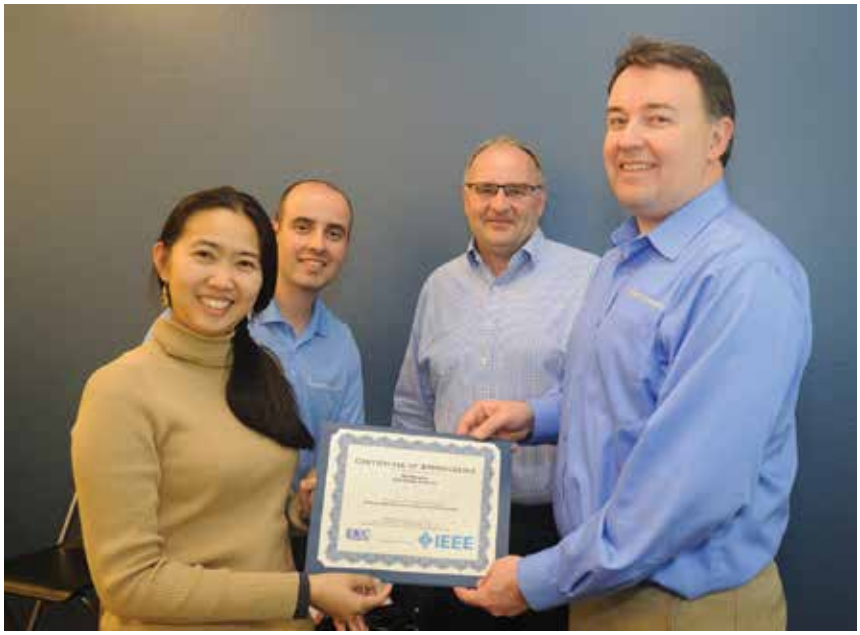
The meeting concluded with an "Ask the Experts Panel" moderated by Craig Fanning. Our Automotive EMC expert panelists included Don Seyerle of General Motors (GM), Keith Frazier of Ford and Robert Kado of Fiat Chrysler Automobiles (FCA). Based in the greater Detroit area, collectively they have over 80 years of experience working in the Automotive EMC industry. The panelists are active contributors to the CISPR, ISO, SAE and corporate EMC standards for the automotive industry. They were part of the US delegation convening in the Silicon Valley for the ISO/CISPR D automotive EMC standards committee meetings. Attendees asked many questions of the panelists, long after the scheduled time to adjourn!

All agreed it was a great opportunity to network with the automotive experts from Asia, Europe and the Americas while they were in town for the ISO/CISPR D automotive EMC standards committee meetings. It was a memorable Chapter meeting. Many thanks again to the meeting sponsors Siemic/Bureau Veritas and ETS-Lindgren for the great dinner and for organizing the outstanding technical program.

On Tuesday, March 13, 2018, the Chapter returned to 7layers for the presentation "Modern EMC Receiver Measurement Con-

On Tuesday, March 13, 2018, the Santa Clara Valley EMC Chapter returned to 7layers for the presentation "Modern EMC Receiver Measurement Concepts" by Bill Wangard of Rohde & Schwarz USA.

Hamed Kajbaf with Amber Precision Instruments presented "Near-Field Scanning: Searching for Root Causes" on Tuesday, April 10, 2018 at 7layers.



Caroline Chan presented a certificate of appreciation to speaker Bill Wangard of Rohde & Schwarz (far right) as his colleagues Phil Parente and Jens Medler looked on (center left and right).

cepts" by Bill Wangard of RSA Rohde-Schwarz. He explained that EMC receiver architecture has evolved to integrate modern technology and this provides distinct advantages in comparison to traditional swept spectrum analyzers when making EMC emissions measurements. The presentation discussed these advantages including pre-selection, FFT based time domain scan, and real-time spectrum analysis. A live demonstration on an EMC receiver throughout the presentation accentuated the technical concepts presented.

Hamed Kajbaf with Amber Precision Instruments presented "Near-Field Scanning: Searching for Root Causes" on Tuesday, April 10, 2018 at 7layers. He explained that sniffer probes are conventionally used for localizing the sources of radiated emissions from electronic boards and systems. However, EMC engineers know from experience that hot areas, identified by the sniffer probes, do not necessarily correlate with radiated emissions test results. Emission source microscopy (ESM) scanning technology is a powerful tool to identify the radiated emission sources. In this scanning technology, the measurement is performed in "radiative" near-field (Fresnel) region as opposed to conventional near-field scanning which is usually performed in "reactive" near-field region. The phase-resolved measurement technique used in ESM helps with back-calculating the field to board or system surface to localize the contributing sources. This presentation also covered the near-field effects of electrostatic discharge (ESD) and how near-field scanning can be used to identify root causes of ESD failures per ANSI/ESD SP14.5-2015. The correlation between IEC 61000-4-2 and ANSI/ESD SP14.5-2015 was reviewed.

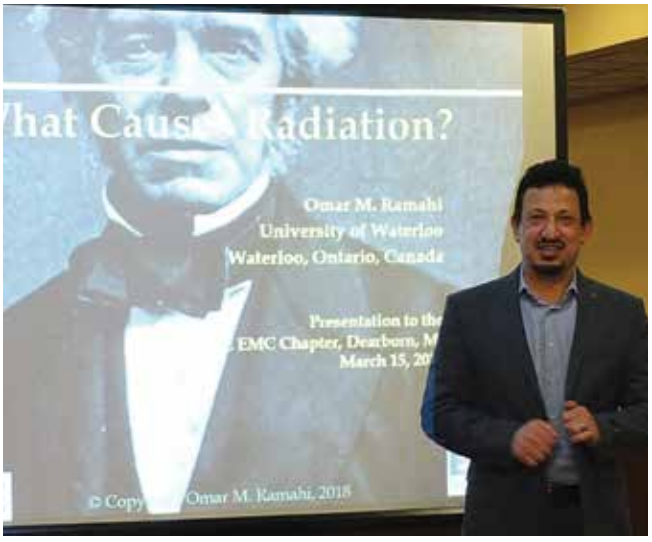
Southeastern Michigan

The Southeastern Michigan Chapter held their second maker challenge on February

The SE Michigan Chapter held their second maker challenge on February 15 using Arduino Uno clones, RGB diodes, photo resistors and supporting components.

Retired electrical engineer, Larry Stempnik, is an Arduino and Raspberry Pi aficionado. He has donated Raspberry Pi computers to and taught free coding classes at local libraries. SE Michigan Chapter members enjoyed learning from him at the February meeting.

Steve Tomba (left), Secretary of the SE Michigan EMC Chapter, thanked speaker Larry Stempnik following the February meeting.



Dr. Omar Ramahi of the University of Waterloo came to the SE Michigan EMC Chapter in March to present, "What Causes Radiation?"

Professor Ramahi discussed the connection between the movement of the elementary charged particle, the electron, and the radiated field.

Scott Lytle (right) Chair of the Southeastern Michigan EMC Chapter congratulates Mr. Mike Hertz of Teledyne LeCroy upon informing him that his professional commitment to the education of Chapter members will be honored by a donation in his name to the IEEE EMC Society President's Memorial Scholarship Fund. Mr. Hertz gave a presentation to the Chapter on April 19 entitled "Measurement and Analysis of Switched-Mode Power Supplies."

15 using Arduino Uno clones, RGB diodes, photo resistors and supporting components. Our speaker, retired electrical engineer, Larry Stempnik, is an Arduino and Raspberry Pi aficionado. He has donated Raspberry Pi computers to and taught free coding classes at local libraries. Larry used a Raspberry Pi to run an Arduino for his presentation and explained the limitations of the computers based on their input and output size. He gave examples of catastrophic failures due to designers not understanding the limitations of their devices. He gave some helpful pointers on programming them. After Larry's presentation, five teams used the required components to design a device. The winning teams had various designs. The first team that finished had a design that blinked out SOS in Morse code when the light level was reduced. It consisted of Edwin Matysiewicz and Frank Suriano. The second winning team's design RGB changed color as the light intensity varied. It consisted of Scott Lytle, Cole and Sarah Booth, Steve Tomba, and Greg Auxier. Grab your Arduinos, Raspberry Pies, make something, and let us know how it turns out!

Dr. Omar Ramahi of the University of Waterloo came to the Southeastern Michigan EMC Chapter in March to present, "What Causes Radiation?" Professor Ramahi discussed the connection between the movement of the elementary charged particle, the electron, and the radiated field. He said since the field of EMI/EMC engineering is related to a large degree to radiation, EMI/EMC engineers are naturally interested in the deep understanding of physics and propagation. He explained that understanding sources/currents that cause radiation is the first step to understand radiation. After all, if the source of radiation is found, containing it becomes easier than not knowing it in the first place. Dr. Ramahi showed that powerful numerical schemes, circuit models, and analytical techniques, while potentially providing an elegant and full solution to the radiating problem, may fail to predict the physical phenomenon of interest. Professor Ramahi showed slides of the difference between the physical current distribution in a slot and predicted distribution of current from computational methods. He reminded us that models do not always have the equations needed to model electromagnetic behavior.

Mike Hertz has been a Field Applications Engineer with Teledyne LeCroy in Michigan for 17 years. Before joining Teledyne LeCroy, he worked in applications and marketing with both Agilent Technologies and Hewlett-Packard in Colorado. With all this experience and six patents pertaining to oscilloscopes, he is always fun to listen to, as we did in April, when he explained the fundamentals related to oscilloscopes and measurements of interest for designers of switched-mode power conversion circuits and devices! Mike talked to the Southeastern Michigan Chapter about how not understanding the basic physics of probes can lead engineers astray. Probes can hold energy and interact with the energy being measured. They have to be carefully used. Call him; enjoy his presentation!

Switzerland

On February 5, a one-day workshop was held for technical interchange on the topic of High Power Electromagnetics (HPE), with a focus in Nuclear Electromagnetic Pulse (NEMP), Intentional Electromagnetic Interference (IEMI), and Lightning Electromagnetics. The invited speakers gave lectures or short talks about their research or industrial activities. It constituted a very good opportunity to review the ongoing work about HPE in Switzerland and neighboring countries, and to foster networking and future activities in this domain that has lost some attention during the past years.

The event was organized with the support of the EMC laboratory of the Swiss Federal Institute of Technology (EPFL) and its head Prof. Farhad Rachidi, the URSI Swiss National Committee, and Montena Technology. We counted more than 70 participants coming from Industry (46%), Academia (43%), Government agencies (8%), and other (3%) backgrounds.

Taipei

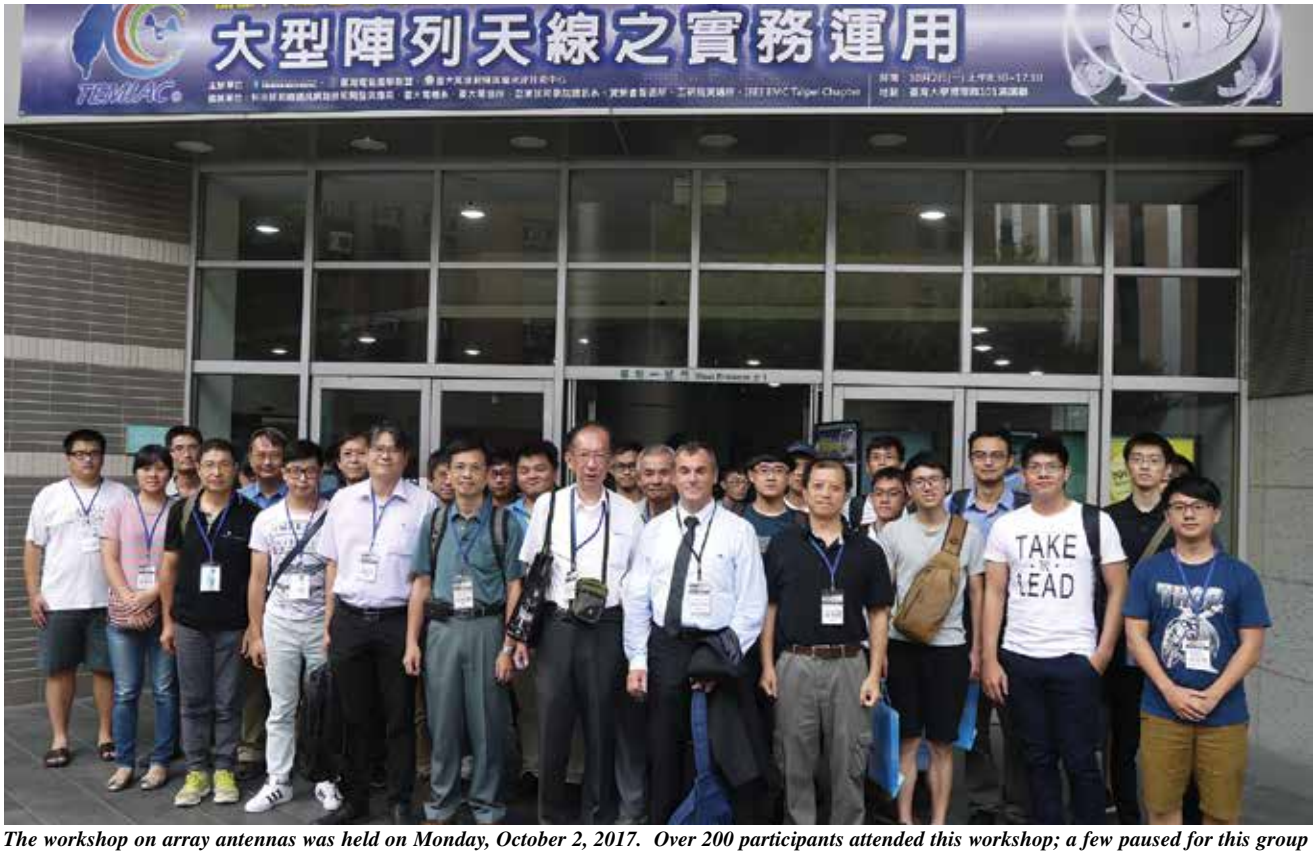
The workshop in the area of array antennas, co-hosted by Prof. Hsi-Tseng Chou, National Taiwan University and Prof. Ding-Bing Lin, National Taiwan University of Science and Technology, was held in

The Taipei EMC Chapter helped organize a workshop in the area of array antennas, co-hosted by Prof. Hsi-Tseng Chou, National Taiwan University and Prof. Ding-Bing Lin, National Taiwan University of Science and Technology.

Barry Lam Hall room 101 on Monday, October 2. The objective was to deliver the knowledge about recent advances and future trends in array antennas to industry and students. It was co-sponsored and co-organized by Taiwan Electromagnetic Industry-Academic Consortium and Educational Ally of RF Circuit Design in Mobile Communication supported by the Ministry of Education, in cooperation with High-Speed RF and mm-wave Technology Center, National Taiwan University, Graduate Institution of Communication Engineering, National Taiwan University, Oriental Institute of Technology Department of Communication Engineering, IEEE EMC Taipei Chapter, Institute for Information Industry, and Industrial Technology Research Institute.

Many applications require radiation characteristics that may not be achievable by a single element. However, it may be possible that an aggregation of radiating elements in an electrical and geometrical arrangement (an array) will result in the desired radiation characteristics. The array antenna was first utilized in the military field, such as radar. Nowadays, it has been applied to various areas of communications including MIMO (Multiple Input Multiple Output), Massive MIMO, and so on. With the development in technologies like fifth-generation mobile network, Internet of Things (IoT) etc., the design considerations for the antennas become more diverse and complicated. Larger bandwidth, beam shaping, short range device to device communications, operation in wider range of frequencies etc. are some of the key requirements, and array antennas are expected to play an important role in achieving these requirements.

The workshop featured several invited key experts and professors in the field including CEO, Yao-Ming Tsai, from Training Research Co., LTD, TRC; Prof. Paolo Nepa from University of Pisa, Pisa, Italy; Prof. Yu-Jiu Wang from National Chiao Tung University; Dr. Rui Guoli from WHA YU Industrial Co., Ltd.; and engineer, Jian-Jia Chen from National Instruments. The speakers shared experience and knowledge about their respective research which provided a deeper understanding on recent developments and the future of array antennas to the attendees. Student attendees had the opportunity to



The workshop on array antennas was held on Monday, October 2, 2017. Over 200 participants attended this workshop; a few paused for this group photo. The high attendance indicates a growing interest in the field of array antennas.

EMC Society Distinguished Lecturer Andy Marvin gave a presentation at the Turkey AP/MTT/EMC/ED joint Chapter meeting in Ankara.

Prof. Ekmel Özbay, Nanotechnology Research Center, Bilkent University, presented, "Metamaterial Based Nanobiosensors and Nanophotodetectors" at the January meeting of the Turkey Chapter.

Assoc. Prof. Hakan Bacı, KAUST, presented, "Time Marching Schemes for Solving Integral Equations of Electromagnetics" at the February meeting of the Turkey Chapter.

Assoc. Prof. Özlem Özgün, Hacettepe University, presented "The Magic World of Transformation Electromagnetics: Invisibility and Beyond" at the March 2 meeting of the Turkey Chapter.

learn the industrial aspects of technologies in need for industrial applications. This will help students to develop better skills and abilities. We encourage them to make ground-breaking contributions to the field of array antennas in their future careers.

Last but not least, we also provided an hour of forum for exchanging information on the progress of antennas, propagation, electromagnetic theory, and related fields. Mutual interaction among the participants was also one of the important objectives. The forum was chaired by Professor Hsi-Tseng Chou. Attendees used this hour to ask questions to the professors and experts on the stage. In addition to the speakers mentioned earlier, we also invited Prof. Tzong-Lin Wu, Chairman of Graduate Institute of Communication Engineering, National Taiwan University, to take part in this forum. In spite of just an hour, everyone participated in the discussion enthusiastically. It is worth mentioning that more than 210 participants attended this workshop, which indicates a growing interest in the field of array antennas.

Turkey

The Turkey AP/MTT/EMC/ED joint Chapter made a good start to 2018 with two Distinguished Lecturer seminars, five scientific seminars, three industrial seminars, and one special course. IEEE EMC Society Distinguished Lecturer Prof. Andy Marvin visited Ankara, Turkey, and delivered two talks at the Middle East Technical University (about "Shielding") and at Bilkent University (about "Shield Enclosure Metrics"). The technical seminars, each of which attracted 30-50 undergraduate and graduate students, included:

January 2018
Speaker: Prof. Ekmel Özbay, Nanotechnology Research Center, Bilkent University
Topic: "Metamaterial Based Nanobiosensors and Nanophotodetectors"

16 February 2018
Speaker: Assoc. Prof. Hakan Bacı, KAUST
Topic: "Time Marching Schemes for Solving Integral Equations of Electromagnetics"

02 March 2018
Speaker: Assoc. Prof. Özlem Özgün, Hacettepe University
Topic: "The Magic World of Transformation Electromagnetics: Invisibility and Beyond"

23 March 2018
Speaker: Asst. Prof. Selçuk Yerci, Middle East Technical University
Topic: "Light Management in Photovoltaics"

30 March 2018
Speaker: Prof. Ali Serpengüzel, Koç University
Topic: "Silicon Microspheres and Meandering Waveguides for Fiber Optics and Integrated Photonics"

Asst. Prof. Selçuk Yerci, Middle East Technical University, presented, "Light Management in Photovoltaics" at the March 23 meeting of the Turkey Chapter.

Prof. Ali Serpengüzel, Koç University, presented, "Silicon Microspheres and Meandering Waveguides for Fiber Optics and Integrated Photonics" at the March 30 meeting of the Turkey Chapter.

Prof. Tayfun Akın, Middle East Technical University, presented "METU-MEMS Center" at the first "industry-based" meeting on February 23.

Dr. Said Emre Alper, Mikrosistemler Co. Ltd., presented, "High Performance MEMS Gyroscopes and MEMS Accelerometers" " at the March 30 "industry-based" meeting.

In 2018, the Chapter started industry-based talks, also given by the experts in their respective fields. These talks included:

23 February 2018
Speaker: Prof. Tayfun Akın, Middle East Technical University
Topic: "METU-MEMS Center"

30 March 2018
Speaker: Dr. Said Emre Alper, Mikrosistemler Co. Ltd.
Topic: "High Performance MEMS Gyroscopes and MEMS Accelerometers"

13 April 2018
Speaker: Dr. Ilhan Varol, Hidromek A.S.
Topic: "Construction Machines – Getting Smarter"

Finally, on 16 March 2018, Prof. Sencer Koç of the Middle East Technical University gave a special course on "Antenna Measurements", attended by more than 40 students.

More information (photographs, YouTube links, etc.) on the past events, as well as the program for the upcoming activities, can be found on the Chapter website: http://aeme.ieee.metu.edu.tr

Twin Cities

On April 25, Zhong Chen of ETS-Lindgren visited the Twin Cities Chapter in Minneapolis for his first lecture as an EMC Society Distinguished Lecturer. The meeting was organized by Chapter Chair David Schaefer of TÜV SÜD America Inc and was held at the popular Buca di Beppo® restaurant in Maple Grove. Zhong presented "Understanding EMC Field Probes." The presentation provided an introduction on the basic operation principles of EMC field probes, and explained parameters of probes such as types of probes, frequency response, linearity, isotropy, and sensitivity. Calibration and applications of the field probes were also discussed. The presentation provided background information so a user can better understand the specifications of a typical probe datasheet, and facilitated the understanding of how to select the best field probe based on his/her application. Zhong provided a review of the applications of field probe and factors that can influence measurement uncertainties, such as probe orientations with respect to incident field, fixtures, and properly applied correction factors. He explained how probe readings can be impacted under modulated or other complex signals. Zhong Chen is the Director of RF Engineering at ETS-Lindgren, located in Cedar Park, Texas. He has over 20 years of experience in RF testing, anechoic chamber design, as well as EMC antenna and field probe design and

Dr. Ilhan Varol, Hidromek A.S., presented, "Construction Machines – Getting Smarter" at the April 13 "industry-based" meeting.

Prof. Sencer Koç of the Middle East Technical University gave a special course for the Turkey Chapter on "Antenna Measurements" on March 16.

measurement. He is an active member of the ANSI ASC C63® committee and Chairman of Subcommittee 1 which is responsible for the antenna calibration (ANSI C63.5) and chamber/test site validation standards (ANSI C63.4). He is chairman of the IEEE Standard 1309 committee responsible for developing calibration standards for field probes. His research interests include measurement uncertainty, time domain measurements for site validation and antenna calibration, and development of novel RF absorber materials. Zhong Chen received his M.S.E.E. degree in electromagnetics from the Ohio State University at Columbus. He may be reached at zhong.chen@ets-lindgren.com. **EMC**