Chapter Chatter

Dennis Lewis, Associate Editor

Happy New Year! With the advent of a new year and new responsibilities at work and within the IEEE EMC Society Board of Directors as your VP of Conference Services, I am stepping down as the Associate Editor for Chapter Chatter effective with this issue of the EMC Magazine. I have enjoyed working with the over 80 EMC Chapters around the world. It has been exciting to learn about their respective activities from Chapters located in cities from Albuquerque to Xian. I feel honored to have served as an Associate Editor and be included with several illustrious past Associate Editors for Chapter Chatter, such as Ira M. Berman (1968-1973), Charlie Anderson (1973-1992), Todd Hubing (1992-2001) and Todd Robinson (2001-2016). I was actually surprised to be appointed as the Associate Editor since my name was not Todd! In any case, it has been a pleasure being a part of the EMC Magazine. Stay tuned for the next issue when my replacement will be announced. In the meantime, I hope you enjoy the following contributions from several of our active EMC Chapters.

Bangalore

Bangalore EMC Chapter Chair, Mr. Rajasekharan NK with ETS-Lindgren, provided a summary of activity for 2018-2019. Officers of the Chapter include Secretary - Mr. Shiva S. Rai, LRDE; Vice-Secretary - Mr. Niranjan Hebbale, Complus; Treasurer - Mr. PR Vijayan, EMI Solutions; Membership Coordinator - Rajasekharan NK; Program/Activity Coordinators - Dr. D C Pande (LRDE) Retired, Industry and Dr. Joy Thomas (IISc), Academic; and the Chapter Angel is Ms. Janet O'Neil, ETS Lindgren, USA. There are currently 28 active members of the Chapter. Following is a summary of the speakers and topics at the 2018-2019 conferences and meetings:

- The 15th International Conference on Electromagnetic Interference and Compatibility (INCEMIC 2018) was held in Bangalore, India from 13-16 November 2018 at the NIMHANS Convention Centre, Bengaluru. The Conference covered the entire scope of electromagnetic compatibility and attracted over 200 attendees. EMC Society Distinguished Lecturer Zhong Chen presented during the conference.

- Dr. C. J. Reddy, IEEE Fellow, Vice President, Electromagnetics, Altair USA, presented "Computational Electromagnetic Techniques for Analysis of Defence Applications using FEKO" on December 11, 2018.

- Dr. Adrian Matoi, International Sales Engineer, EMC Partner AG, presented "Indirect Lightning and Other Conducted Susceptibility Tests in MIL-STD-461G" on March 14, 2019.

- Mr. Richard Leonard, Business Development Manager, M/s PPM Test, UK, presented "Developments in RF over Fibre Systems for EMC Testing" on June 19, 2019.

- The Global Electromagnetic Compatibility Conference (GEMCCon 2019) was held in Bangalore over 6-8 November 2019 at the Sheraton Brigade Hotel. EMC Society Distinguished Lecturer Zhong Chen presented at VIT University in Vellore (IEEE Madras Chapter) on November 4, 2019.

The Bangalore EMC Chapter recently elected officers for the term 2020-2021. Dr. Ananth Krishna, Co-Founder and CEO, iAMPS & Hz Technology Solutions Pvt Ltd, has kindly offered to volunteer his services as the secretary of IEEE EMC Society Bangalore Chapter for 2020-2021. Prof. Dr. Joy Thomas of the Department of High Voltage Engineering, IISc, has kindly offered to volunteer his services as the Chairman of IEEE EMC Society Bangalore Chapter for 2020-2021.

Moving forward, the Chapter intends to

Speaker C. J. Reddy with Altair visited with Mr. Saha and Dr. D. C. Pande (from left) following the Bangalore EMC Chapter meeting on December 11, 2018.

The Vellore Institute of Technology (VIT) hosted an EMC Chapter meeting. Organizers included (from left) Zhong Chen, Vignesh Rajamani with Exponent, Rajasekharan NK (Raj), host Professor Zachariah C. Alex (VIT), Prince C., and Rajesh M. - Zhong, Raj, Prince and Rajesh are with ETS-Lindgren.

Zhong Chen, EMC Society Distinguished Lecturer, gave a presentation titled "Advanced Antenna Measurement Techniques Using Time Domain Transformation" to a full house at VIT on November 4, 2019.

Following the presentation, meeting attendees went to the lab at VIT to see a demonstration of time domain measurements. Vignesh Rajamani is shown providing an overview of the demonstration.

hold at least one Distinguished Lecturer meeting in 2020 and conduct joint Chapter meetings (MTT/AP/EMC) for DL Lecture Programs. Dr. Harish Mysore, Senior Director of the IEEE India office, and his team provided great support during GEMCCon 2019. The Chapter will work closely with the IEEE Bangalore Section and focus on academic training and certificate courses. The Bangalore Section and the Bangalore EMC Chapter will work together to sustain the Chapter with new members and interests. It is heartening to note that membership has gone up from 15 in 2018 to 28 Chapter members in 2019. The Chapter will also maintain its Sister-Society relationship with the Society of EMC Engineers India (SEMCEI) for future events, including the 16th International Conference on Electromagnetic Interference and Compatibility (INCEMIC 2020) and Workshop planned in November 2020 jointly with SEMCEI and Co-sponsored by IEEE EMC Society. The program includes two days of workshops followed by two days of the conference. Further information will be published soon.

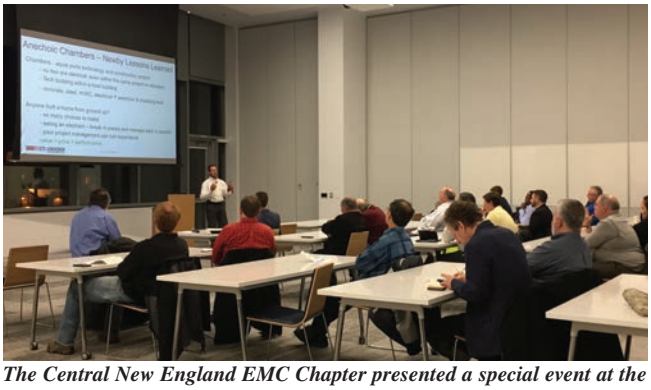
Central New England

The Central New England EMC Chapter organized a special event at the "New Expeditionary Cyber and Unmanned Aerial System (UAS) Flight Facility" at Northeastern University Innovation Campus in Burlington, Massachusetts. The event was scheduled from 4:00 – 8:00 pm and included three presentations, a complimentary dinner, plus a guided lab tour and live demo.

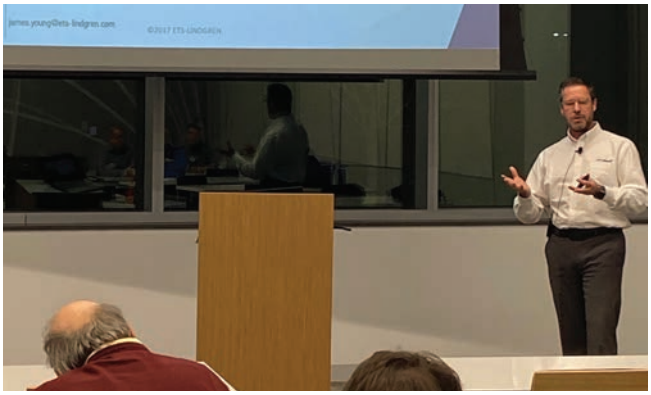
James Young, Director of Business Development with ETS-Lindgren in Cedar Park, Texas, gave the first presentation "You Want a Chamber for What? Design Inputs That Drive Unique Test Facilities." He described that anechoic chambers need not be just a metal box with absorber patches here and there. Rapidly evolving technologies such as autonomous cars, unmanned aerial vehicles (UAVs), and mmWave 5G communications are driving some innovative design work in today's modern anechoic chambers. The Northeastern University in-flight drone test facility is one of several completed environments that solved considerable design challenges. In particular, a single chamber for antenna pattern and EMC measurements to verify performance of drones in-flight required many new approaches and solutions. Additional challenges such as 5G mmWave measurements beyond 200 GHz, testing all the sensor systems on autonomous vehicles, or building an EMP survivable command center in a commercial building, have pushed far past traditional chamber construction methods and design parameters. The presentation reviewed a sampling of today's challenging test requirements that resulted in unique test facilities.

Jose Martinez-Lorenzo, Associate Professor at Northeastern University, and Director of the Sensing, Imaging, Control, Actuation, and Artificial Intelligence Laboratory, gave the second presentation, "Sensing, Imaging, and Deep-Learning at Speed for Networked Robotic Swarms of UAVs using 4D Information Theory and mm-wave Radar." The professor explained how mmWave sensing and imaging systems are ubiquitously used in a wide range of appli-

Zhong Chen showed how time domain gating is an effective technique to remove reflections in antenna measurements. Following the demonstration, attendees viewed the newly installed 3-meter EMC test chamber at VIT.



The Central New England EMC Chapter presented a special event at the "New Expeditionary Cyber and Unmanned Aerial System (UAS) Flight Facility" at Northeastern University Innovation Campus. Part of the new facility is the great meeting room shown here.



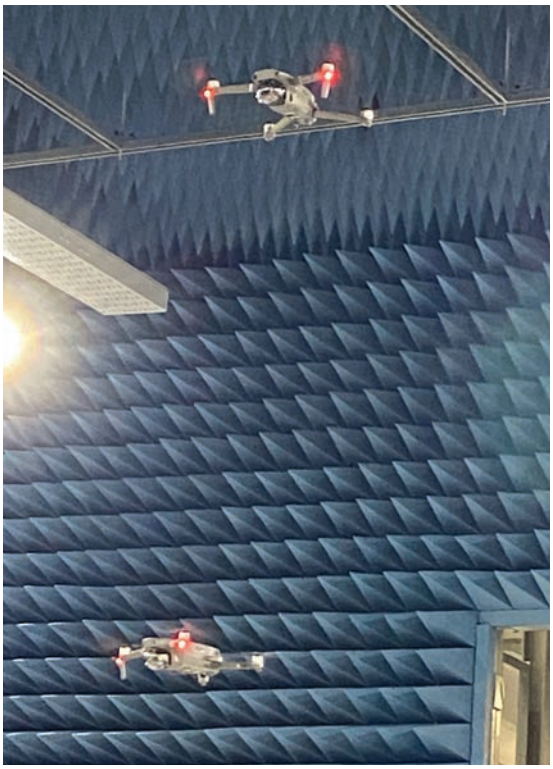
James Young of ETS-Lindgren gave a presentation on unique test chamber designs at the Central New England EMC Chapter meeting held on November 12 in Burlington, Massachusetts.

Following the presentations, Central New England Chapter members toured the large RF Anechoic Chamber used for UAS R&D. There is also a large netted outdoor test site - the UAVs can fly from the outdoor test site into the chamber through a large RF shielded door!

cations, such as atmospheric sounding of the earth to forecast the weather, non-destructive-testing to assess the condition of civil infrastructures, and security monitoring to detect potential threats in airport checkpoints. These systems typically operate well when the scene dynamics does not change rapidly. Unfortunately, this is not the case in emerging societally important applications like swarms of drones in rescue missions, smart self-driving cars on roadways, or cyber-physical systems searching for suicide bombers when they are on the move. These new applications require high throughput communications, sensing and imaging at high video frames, as well as adapting the sensing process to the outcomes of online learning. With these challenges in mind, one of the key features of the next generation imaging systems will be the ability maximize the information transfer efficiency between the sensors and the imaging domain. One way to achieve this is to merge traditional 1D temporal mm-wave coding with 3D dynamical coding of the wavefield in space, as well as to dynamically adapt the sensing process based on the information provided by other orthogonal sensors, like 4D stereo cameras. The presentation covered the theoretical principles and fundamental limitations of new sensing, communications, and imaging systems that leverage on Information Theory to enable 4D coding at mm-wave frequencies.

Matthew Kling, Director of the Expeditionary Cyber and UAS Lab, provided an overview of the one-of-a-kind facility as well as the research it supports. The facility was built as a multi-purpose research facility that can host experiments and tests related to autonomous drones/vehicles, manually piloted drones/vehicles, indoor flight navigation, GPS denied/degraded environments, drone

Matthew Kling, Director of the Expeditionary Cyber and UAS Lab, provided an overview on the one-of-a-kind facility as well as the research it supports at the Central New England Chapter meeting.



The UAS flight facility was designed for multi-purpose R&D, including experiments and tests related to autonomous and manually piloted drones/vehicles as shown. It was definitely a novel meeting for the Central New England EMC Chapter.

Guests at the Chicago EMC Chapter's St. Patrick's Day meeting got an EMC-insiders look at the new E-Harley LiveWire™.

Chicago EMC Chapter Chair Jack Black recognizes speaker Joanna McLellan of EMC Productivity at the April meeting.

detection and tracking, machine learning for autonomous vehicles, wireless networking, contested/congested wireless environments, antenna testing/characterization, and EMP testing. After the facility overview, Matthew and his staff provided a tour of the facility for the meeting attendees, including a demonstration within the anechoic chamber that highlighted some of their current research in these areas. If you would like to learn more about the Expeditionary Cyber and UAS Lab, please contact Mr. Kling at m.kling@northeastern.edu.

Chapter members appreciated the unique meeting with very informative presentations and impressive facility tour. The live demonstration of an unmanned aerial system was very exciting and certainly a novel way to end the Chapter meeting. Many thanks to the staff at Northeastern University who provided the hospitality and warm welcome to their new Expeditionary Cyber and Unmanned Aerial System Flight Facility.

Chicago

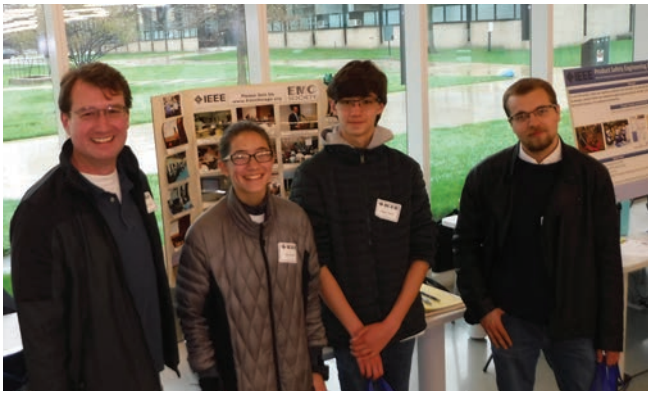
The Chicago Chapter's annual St. Patrick's Day Fest on March 13 was hosted at ELITE Electronic Engineering in Downers Grove, Illinois - home of Chapter Treasurer, Ray Klouda. The event was co-sponsored by the SAE Chicago Section and the IEEE Vehicular Technology Society (VTS). Jim Rader of Harley Davidson Motorcycles discussed design challenges in their LiveWire™ electric motorcycle. The overflow crowd enjoyed the seasonal food and drink and hovered anxiously around the sample motorcycle; we were sorry that there were no test rides!

The April 16 meeting at IIT's Rice/Wheaton, Illinois campus included a Chapter provided picnic dinner. Speaker Joanna (Hill) McLellan, principal of EMCproductivity.com in Detroit, Michigan explained how power plane bypassing actually works and debunked popular design myths.

We supported the 125th anniversary of the IEEE Chicago Section founding on April 27, hosted at the IIT Kaplan Center downtown campus. Various Societies and Affinity groups in the area staffed 30 information booths with posters and interactive demonstrations, designed to inform and engage citizen attendees of all ages. Our EMC booth included historic test equipment.

The 22nd annual MiniSymposium on May 7 was a rousing success, thanks to ongoing organizer Frank Krozel, Chapter and industrial partner volunteers, loyal exhibitors and attendees. Special thanks to sole presenter Eric Bogatin of Teledyne-LeCroy for his four engaging talks with hands-on demonstrations. Eric encouraged audience participation by tossing out candy rewards for any answer or question. Eric's powerful teaching method was to surprise us that the initial idea of the controlling mechanism was wrong and why then what is the correct theory. The luncheon banquet offered huge portions of multiple main courses. The always popular EMC-opoly game encouraged guests to interact with the 24 exhibitors while multiple raffle prizes punctuated the proceedings.

June 27 was a bonus VTS joint meeting hosted by DLS Electronic Systems in Wheeling, Illinois - home to long-time supporter Don Sweeney and Chapter Chair Jack Black. The DLS expert EMC grillers provided the burgers and brats. Then DLS's Corey Bradshaw explained automotive EMC test methods for immunity and emissions. Thank you DLS for hosting the great kick-off to our summer hiatus!

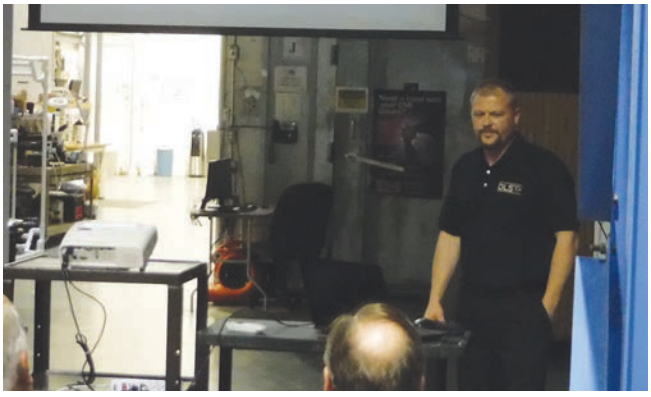


The Chicago EMC Chapter's booth at the 125th IEEE celebration in April attracted and informed attendees of all ages.

Jack Black (left), Chicago EMC Chapter Chair, recognizes Eric Bogatin for presenting at the Mini-Symposium.

The lunch held during the Chicago EMC Chapter's Mini-Symposium on May 7 was well attended.

The expert EMC grillers with DLS Electronics assisted with the dinner provided at the summer kick-off joint meeting with the Vehicular Technology Society.



Corey Bradshaw with DLS Electronics explains automotive EMC tests at the Chicago EMC Chapter meeting on June 27.

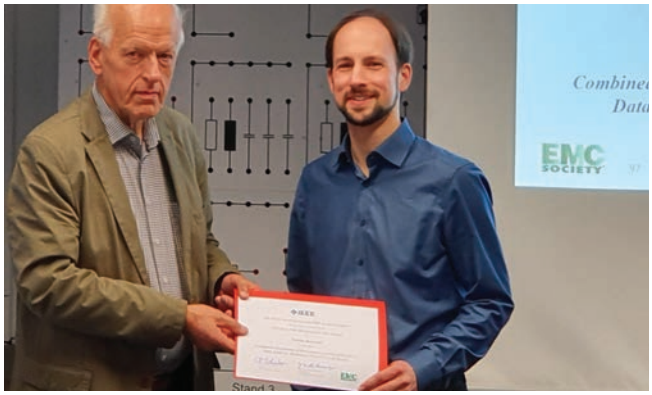
Chicago EMC Chapter Chair Jack Black (left) with DLS Electronics thanked the OktoberFest speaker Andy Marvin for his presentation on shielded enclosure metrics.

Mike Hertz of Teledyne LeCroy presented on switch-mode supply measurements at the November meeting of the Chicago EMC Chapter.

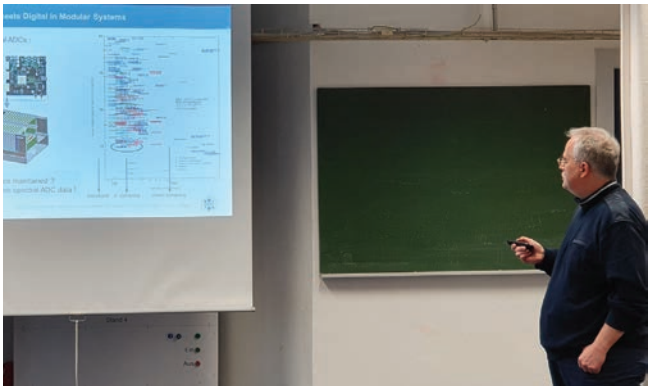
Matthias Tröscher with Dassault Systèmes welcomes participants to the 2019 EMC Boot Camp held on November 6-7.

Mathias Magdowski with OvGU Magdeburg talks about the basics of EMC at the Germany EMC Chapter Boot Camp.

Christian Schuster congratulates Susanne Kaule upon her election as the Germany EMC Chapter Chair for 2020-2021 during the meeting at the Hamburg University of Technology (TUHH).



Torsten Reuschel (right) receives the award for the best Ph.D. thesis from Prof. ter Haseborg, Chair of the Awards Committee, at the annual meeting of the Germany EMC Chapter.



Frank Ludwig with DESY Hamburg discussed aspects of "EMC in Modern Electronic Standards" at the Germany EMC Chapter meeting on November 27.

Chicago was very active at the annual 2019 IEEE Symposium on EMC+SIPI in New Orleans. Jack Black reported at the Chapter Chairs meeting. Louann Mlekodaj co-hosted the Young Professionals (YP) Jeopardy! Event, Chaired the workshop on Education and Training and presented. Jerry Meyerhoff Chaired and presented in the 9th annual Consultants Tool Kit workshop and presented in Tom Braxton's TC-1 and TC-2 tutorials. The symposium was a very busy and fun combination of technology, networking, education, bicycling and beignets.

The September 25 meeting at the IIT Rice Wheaton campus included pizza and Jack Black's talk on the RED - Radio Emissions Devices - regulations. On October 15, ELITE sponsored OktoberFest, our annual meeting that featured Professor Andy Marvin from the University of York in the United Kingdom. The fantastic seasonal German meal was followed by Andy's excellent talk, "Shielded Enclosure Metrics". Andy shared new investigations of losses in the reverberation method from real PCBs populated with components and emerging time-domain analysis methods.

On November 19, the Chapter held a joint meeting with the Northwest Subsection Chicago at a new venue for our Chapter, Oakton Community College in Desplaines. It was organized by Connie Kelly and the catering was excellent. Attendance was very good for speaker Mike Hertz of Teledyne LeCroy. Mike explained how switch mode power supplies could be completely analyzed with modern digital oscilloscopes, by proper application of the many built-in features. Our Holiday Party is scheduled for December 11 at a favorite restaurant, Maggiano's Little Italy. The Chicago EMC Chapter wishes everyone a Joyous Holiday Season. Keep up with our activities by visiting www.emcchicago.org.

Germany

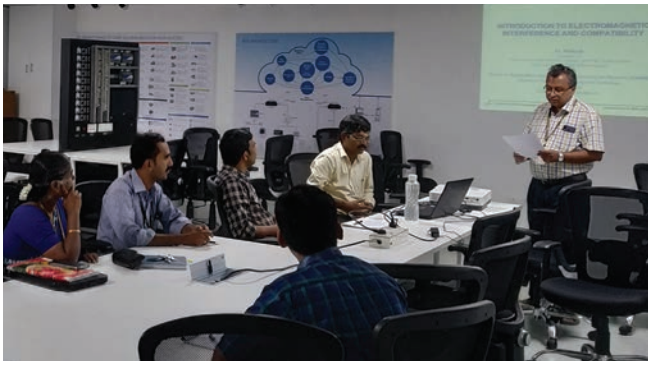
The Germany Chapter of the EMC Society organized its fourth two-day EMC Boot Camp on November 6-7, 2019. This time, the event was held at Dassault Systèmes Germany GmbH in Darmstadt. The company provided its conference rooms and canteen for the Boot Camp. The Boot Camp was provided free of charge for the participants. Some 60 participants as well as 16 lecturers attended the event and enjoyed various lectures and workshops on selected topics in the field of electromagnetic compatibility. Furthermore, in a small exhibition area, a few test and measurement companies presented the latest measurement technology.

Also presenting on November 27 was Jan Preibisch with Nexperia Hamburg. He provided information on "Simulation of ESD Discharge in Automotive Applications".

Speakers from industry and academia focused on basic knowledge of EMC as well as specific EMC issues. Not only the wide spectrum of the lectures, but also the pleasant atmosphere in the seminar rooms and the numerous conversations during the coffee breaks, contributed to the success of this fourth boot camp. The planning for a fifth Boot Camp in 2020 as a follow-up event is already ongoing.

On November 27, the annual Chapter meeting of the German EMC Chapter took place at the Hamburg University of Technology (TUHH) hosted by the Chair of the Institut für Theoretische Elektrotechnik, Christian Schuster. In his role as acting Chapter Chair, he presented the results of the vote for the new term of office for the elected executive committee (EC). Starting in January 2020, Susanne Kaule will act as Chapter Chair. During the Chapter meeting, an award for the best Ph.D. thesis in the field of EMC was awarded to Torsten Reuschel. His thesis is entitled "Combined Assessment of Interconnect and Equalization in Data Links on Multilayer Printed Circuit Boards". After the award ceremony, he gave a short lecture about the technical details of his work. In addition to the formal reporting of all the EC members, two technical talks were given by Frank Ludwig with DESY Hamburg and by Jan Preibisch with Nexperia Hamburg.

Finally, the meeting was a very informative



Professor Zachariah C. Alex of the Vellore Institute of Technology (VIT) introduced the speakers before their presentations at the joint meeting of the IEEE EMC Madras Chapter and the Society of EMC Engineers (India) Chennai Chapter.

Speaker G. Mahesh with SAMEER presented "Introduction to EMI and EMC" as part of the Faculty Development Programme at the Madras EMC Chapter meeting.

Speaker Mahesh Chaluvadi with SAMEER presented "EMC Measurement Techniques" at the joint Chapter meeting in Vellore.

After the final presentation, a few attendees and speakers posed for a photo, including (from left) Suresh Kumar T. R., Kasturi S. Patil, Shambavi K., Elizabeth Rufus of VIT, G. Mahesh, Dr. Zachariah C. Alex, Mahesh Chaluvadi, and Sasikumar P. of VIT.

and a good opportunity for exchange, both in technical and social terms. The next annual meeting in 2020 will be hosted by IAV GmbH in Gifhorn on November 25.

Madras

The Vellore Institute of Technology (VIT) in Vellore, Tamilnadu, India, was privileged to organize a one-day Faculty Development Programme (FDP) titled "Demystifying Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC)" jointly with the IEEE EMC Madras Chapter and the Society of EMC Engineers (India) Chennai Chapter. Held on September 25, 2019, the emphasis of the FDP is to impart knowledge on multiple aspects of EMI and EMC among the facilitators and researchers. The guest speakers were Mr. G. Mahesh (Senior Member - IEEE and Vice-Chair IEEE EMC Madras Chapter) and Mr. Mahesh Chaluvadi (Member- IEEE and IEEE EMC Madras Chapter) who are scientists with the EMC Division of SAMEER, Centre for Electromagnetics, in Chennai, India. Professor Zachariah C. Alex, Director, Sponsored Research and Industrial Consultancy, with VIT, introduced the guest speakers, and elaborated on the purpose of the FDP. He also shared information on the EMC related activities taking place at VIT.

The first talk was by Mr. G. Mahesh who provided an "Introduction to EMI and EMC" which included many historical incidents attributed to EM interference. His next talk was on "EMC Standards" which are applicable to industry and the automotive sector. His talks gave insight into various radio frequency interference problems encountered and touched on EMC design techniques. In his final talk, Mr. Mahesh shared his experience with EMC techniques applied for some products that failed during the initial compliance testing. This topic especially was of great interest to all participants.

Subsequently, Mr. Mahesh Chaluvadi gave a presentation on "EMC Measurement Techniques" in which he outlined radiated emission/susceptibility and conducted emission/susceptibility measurement techniques. In his presentation, he showed videos on EMC measurements for better understanding, which attracted attention from the curious participants.

At the closing of the event, Suresh Kumar T. R., Treasurer, IEEE EMC Madras Chapter, thanked the Chair of the IEEE EMC Madras Chapter, Mr. P. Salil, who was instrumental in organizing the joint EMC Chapter - Academia event. Thanks are also due to Professor Shambavi K. and Suresh Kumar T. R., School of Electronics Engineering, who coordinated the event. About 15 attendees including faculty and researchers participated.

New Jersey Coast

The New Jersey (NJ) Coast joint EMC/AP/VT Chapter had an excellent year with multiple technical activities throughout the area. The officers for the year 2019 included K. Raghunandan, Chair, raghunandan@ieee.org; Katherine August, Vice Chair, kit@ieee.org; Neerja Sharma, Neerjasharma@

ieee.org; and Filomena Citarella, Secretary, fcitarella@ieee.org.

On April 17, 2019, the MTT Distinguished Lecturer presentation was very well attended by over 20 members. The topic connecting microwaves and optical communication has great promise and was implemented in several projects. The speaker, Dr. Ed Ackerman, was very informative and positive about research work in the area.

The year 2019 marked the milestone of Project Diana – an attempt by US Armed Forces to use radar to bounce signals off the moon. This was a post-World War II project that became a forerunner to satellite communication systems. The IEEE NJ Coast Section and the AP/EMC/VT Chapter pursued an effort to obtain milestone status for this project. Dr. Katherine August, who worked with the historic evaluation committee and provided them the necessary evidence and support documents, successfully led the effort. She worked with many individuals and organization such as the InfoAge Museum where this project was successfully pursued. The citation from the IEEE History Committee reads, "On 10 January 1946, a team of military and civilian personnel at Camp Evans, Fort Monmouth, New Jersey, USA, reflected the first radar signals off the Moon using a specially modified SCR-270/1 radar. The signals took 2.5 seconds to travel to the Moon and back to the Earth. This achievement, Project Diana, marked the beginning of radar astronomy and space communications". To celebrate the event, the IEEE NJ Coast Section decided on a two-tier celebration. The first was to make "Project Diana – Moon Bounce" as the theme for the annual banquet on May 17, 2019. Presentations on moon bounce and celebrations were held at the banquet at the Colts Neck Inn, which was widely attended by members of many sections in the area.

This was followed by a separate milestone plaque unveiling by Dr. John Vig (past President of IEEE) on May 18, 2019. This celebration was held at the Camp Evans site that is now converted to the InfoAge Museum in the township of Wall, NJ. The mayor of the township as well as many IEEE and museum enthusiasts, veterans and others attended the function. A wonderful recount of the history of Diana was narrated by Ray Chase, a veteran who is closely associated with the family members of military personnel who were part of Project Diana. This was followed by a demonstration of voice bounce off the moon by Lori Lauber using a radar operations desk at the museum. She welcomed anyone interested to get it touch with the museum to come and see for themselves how their voice bounces off the moon returning 2.5 seconds later. Dr. Jules Bellisio, FIEEE, stressed the importance of the museum and its contributions to enthuse youngsters about the history of science in the area.

On May 19, 2019, Prof. Kaushik Rajashekhara with the University of Houston, Texas, and Distinguished Speaker from the IEEE Vehicular Technology Society, provided an excellent overview of electric vehicle technology and its progress in the auto industry as well as aircraft industry. This was an impressive talk given that the speaker personally worked on the design of electric cars such as Volt and electric power plants of jet engines and aircraft. The presentation was very well received by the audience and led to many questions and interactive sessions.

Dr. John Vig, a past President of the IEEE, unveiled a mileston plaque to commerate Project Diana as part of the celebration at the InfoAge Museum.

To view many more photos, videos, and articles about these and other events in the IEEE New Jersey Coast Section, please see the Section History Wiki at: https://ethw.org/IEEE_New_Jersey_Coast_Section_History

Phoenix

Glen Gassaway of Southwest EMI Consulting reports that the first Phoenix EMC Chapter meeting of the 2019-2020 season was held at Compliance Testing Labs in Mesa, Arizona on Thursday, November 7. The evening began at 5:30 pm with the customary social hour and an excellent Mexican food dinner from Manuel's Mexican Restaurant in Tempe. The meeting itself began at 6:45 pm, with Glen (our Chapter Chair) discussing Chapter business. Glen asked the membership how the Eventbrite invitation system was

On May 18, 2019, the IEEE New Jersey Coast joint EMC/AP/VT Chapter celebrated Project Diana at the InfoAge Museum in the township of Wall, New Jersey. The mayor of the township as well as many IEEE and museum enthusiasts, veterans and others attended the function as shown above.

The IEEE New Jersey Coast Section held its annual banquet on May 17, 2019 with "Project Diana – Moon Bounce" as the theme. Several members of the New Jersey Coast joint EMC/AP/VT Chapter attended the festive event.

Bob Ydens of EMI Solutions presented on RF/EMI filters at the November Phoenix EMC Chapter meeting.

working. Most members liked the new registration system. Glen also announced that we would have officer elections early next year. We then did our customary around-the-room introductions.

Glen then introduced our featured speaker, Bob Ydens of EMI Solutions. Bob is the Senior Founding Engineer and President of EMI Solutions, headquartered in Irvine, California. He has spent over 35 years focused on electromagnetic interference technology. His presentation was titled "A Basic Overview of RF/EMI Filters and Filtered Connectors".

Bob talked about how and when to use C, L-C, C-L and PI filter connectors and filter inserts. The idea is to identify the capacitance of the filter to operate at the correct frequencies, select the capacitance so it does not interfere with the intended signals, and to choose the optimum capacitance based on the -3 dB cutoff frequency. A capacitor only "C" filter has the narrowest "Q" which is greatly impacted by its mechanical packaging. They are useful to stop a limited range of noise, but they have little high frequency performance. Filters that contain ferrite inductors operate over a much wider range.

It is important to place a filter component where it will do the most good. Filter connectors are well positioned as compared to internal filters, since they are at an ideal location - at the enclosure wall.

Bob also spoke about the difference between discoidal and planar arrays. At one time, planar arrays had industry-wide issues with cracking caused by thermal cycling. Bob's company uses spring clips or solder washers to overcome that problem.

Finally, Bob showed real-world radiated emission test data that illustrated his points. Broad emissions 15 dB above the specification limit were reduced using several topologies, showing how each worked. Eventually a 25,000-pF discoidal array was used to hold the emissions below the limit. After the talk, Glen Gassaway thanked Bob for his fine presentation! The meeting adjourned at 8:00 pm. We are grateful to Compliance Labs in Mesa, Arizona for hosting and providing their facilities for this event.

Pittsburgh

A technical meeting for the joint Pittsburgh EMC Society Chapter and Power & Energy/Industry Applications Chapters was held on Tuesday, March 26, 2019 at the Westinghouse Headquarters, in Cranberry, Pennsylvania. Michael Oliver, Pittsburgh EMC Chapter Chair, and Steve Dobos, Power & Energy/Industry Applications Chapter Chair, hosted the meeting with 16 persons in attendance.

The meeting started with a social/dinner hour prior to a technical presentation. We had the privilege of having Louann Mlekodaj as our technical speaker. Louann Mlekodaj currently works for Shure Inc. located in Niles, Illinois (just outside of Chicago) as a Project Digital Wireless Engineer and holds two US patents and several foreign

The joint Pittsburgh EMC Society Chapter and Power & Energy/Industry Applications Chapter held a meeting at the Westinghouse Headquarters in Cranberry, Pennsylvania on March 26, 2019. Guest speaker Louann Mlekodaj with Shure Inc. presented "Product Design to Meet Standards: Whose Job Is It?" Louann kept the audience engaged as shown in the far left and center photos. The chapter provided a great dinner buffet as shown in the right photo.

Exhibitors arrived early on the morning of October 3, 2019 to set up for the Santa Clara Valley EMC Chapter Mini-Symposium.

Consultant Doug Smith presented "Locate ESD Events using the Speed of Light!" at the Santa Clara Valley EMC Chapter Mini-Symposium.

patents. She received a BSEE and MSEE from the University of Illinois at Chicago in 2005 and 2010, respectively, and has been an RF engineer for over 12 years in the wireless and electromagnetic industry. Louann has been an IEEE member for over 10 years, and active within the IEEE EMC Chicago Chapter promoting the local Chapter and educational activities at the local level. Most recently, she was elected to be the IEEE EMC Young Professional representative for the EMC Society. At the meeting, discussions addressed facility safety, fire exits, and future IEEE meetings by Steve Dobos. The technical presentation was discussed and Mike Oliver provided an introduction of Louann Mlekodaj.

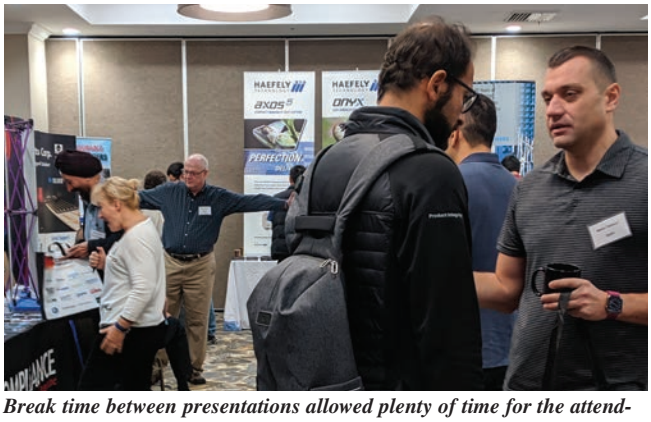
The technical presentation by Louann was titled "Product Design to Meet Standards: Whose Job Is It?" The presentation focused on the fact that an objective of business is to provide products that meet customer needs. Defining requirements to meet those needs and satisfy markets are clearly important. Markets also have regulatory requirements to be met, and manufacturers need to assure that products continue to meet those requirements as they are mass-produced. Louann's presentation discussed the need for product engineers to know regulatory standards and how to maintain compliance with those standards as the product is developed, manufactured, and marketed. She explained how statistical tools and manufacturing limits are used to maintain standards compliance, and it requires a collaborative effort among designers, testers, and manufacturers.

Santa Clara Valley

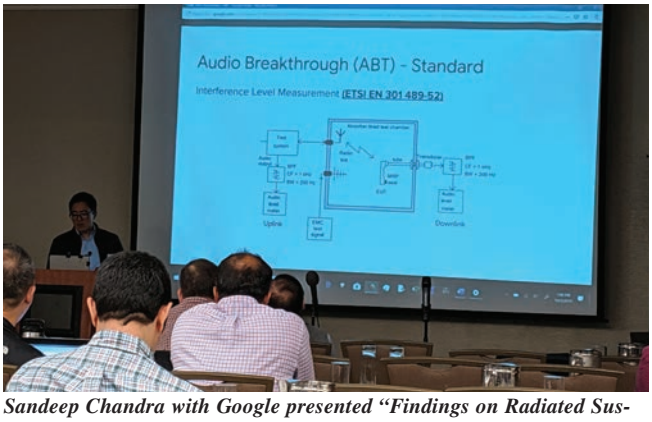
The Santa Clara Valley EMC Chapter Mini-Symposium on Oct 3, 2019 has come and gone in the blink of an eye! The preparation for this event started a year ago with the officers of the Santa Clara Valley EMC Chapter, including Len Goldschmidt, Jerry Ramie, Joseph Nghiem, Caroline Chan, plus Jianmin Zhang, Zhiping Yang and Ram Chundru with the Missouri University of Science and Technology (MST) Alumni Association. The Mini-Symposium was held at the Embassy Suites Hotel in Milpitas, California.

We want to thank the speakers, including Jim Drewniak (former MST Professor), Doug Smith (Consultant), Mark Montrose (Consultant), Sandeep Chandra (Google), Ji Hoon Jang (Google), Philippe Sochoux (Juniper Networks) and Alpesh Bhobe (Cisco) for providing the great presentations. The technical program attracted over 60 attendees and 22 exhibitors.

Dr. Drewniak taught us to think carefully about the pre-layout power integrity through systematic physics-based design. He refreshed our minds with best engineering practices for the design of a power distribution network at the package and PCB level that are well-known. In practice, this comes down to minimizing inductance over the current-draw path. However, many subtle design choices can affect achieving a minimal power net voltage ripple or meeting a target impedance specifi-



Break time between presentations allowed plenty of time for the attendees to network and visit with the exhibitors in the tabletop display area.



Sandeep Chandra with Google presented "Findings on Radiated Susceptibility Audio Breakthrough (ABT)" at the Santa Clara Valley Mini-Symposium.

Consultant Mark Montrose examined Maxwell's equations in his presentation at the Mini-Symposium held at the Embassy Suites Hotel in Milpitas, California.

The reception following the technical program at the Mini-Symposium featured delicious appetizers and provided additional networking time.

cation. In order to achieve a best design with or without constraints on some of these choices, a proven methodology for calculating the portions of inductance associated with particular geometry features is necessary, and a knowledge of inductance physics that can be exploited to achieve the design specification within a given stackup and a minimal number of decoupling capacitors. A systematic methodology has been developed for PDN design and PI analysis that can readily identify a best design given typical design constraints. A method for PDN impedance calculation was shown and an approach for achieving a target impedance was provided. If the target impedance specification is not met, the developed methodology can be used to immediately identify if specifications can be met with design modifications within the constraints, and provide directions in doing so in one or two iterations while avoiding trial-and-error simulations.

Doug Smith demonstrated how to track down the sources of ESD problems in a simple live demonstration after a brief overview of the characteristics of ESD and its effects on equipment. He showed simple and effective troubleshooting techniques that he developed over many years of solving ESD problems. He even invited Geoff Day and Jim Lukash to participate in his experiments. It was very eye opening to figure out where the ESD source was in minutes.

Mark Montrose's brief tutorial examined Maxwell's equations in a visual manner for those who never studied electromagnetic theory in college, or forgot everything years later. Engineers need to understand what the equations tell us without the need to solve complex math that provides minimal or no value to a practitioner who has to solve problems in real-time. It is easy to convert these four equations to simple algebra that allows one to visually detect when and where an EMC event may occur within a printed circuit board design and layout without the need for complex simulation. He converted the field of frequency domain analysis to the time domain as it applies to transmission line theory. How common-mode energy is created was presented in a simplified, unique manner.

The Santa Clara Valley EMC Chapter Mini-Symposium concluded with a raffle of some great prizes. Thanks to the speakers, sponsors, exhibitors and attendees, the event was a big success.

Sandeep Chandra and Ji Hoon Jang prepared a presentation on findings on radiated susceptibility Audio Breakthrough (ABT). ABT testing of mobile phones for conducted and radiated susceptibility is a well-known problem. The problem has shifted from phones to audio dongles over the years and it can be addressed through good filter design at the PCB level. However, there are many subtle test conditions that a typical test lab can get wrong during calibration of the test and during the test itself. This talk explored several variables and scenarios in test conditions that could lead to false positives/negatives. Debugging an RI-ABT failure inside a chamber is a difficult and time-consuming approach. A systematic bench-level approach method was presented for debugging radiated immunity ABT. This bench level approach was validated with actual chamber measurements.

Last, but not least, Philippe Sochoux and Alpesh Bhobe worked together to present a "New Set of EMC Challenges in Telecommunication Equipment". They explained that interface speeds, densities and power continue to increase and present new sets of EMC challenges, both immunity and emissions, in telecommunications equipment. In this presentation, an overview was provided of these challenges and how they are being mitigated. Topics included predictive scaling to minimize early prototype quantities, how to minimize differences in conducted emission results from PSU bench level testing between various suppliers, a novel statistics-based approach to pre-test high speed optics for radiated emissions, as well as other topics and novel solutions that can benefit the overall system design for EMC .

The day started bright and early with the exhibitors setting-up and energizing over a light breakfast. Our attendees were fully engaged with the exhibitors who provided solutions to EMC and SIPI problems during the two breaks, during lunch, and during the reception.

The reception was a big hit with great food and drinks, raffles prizes (gift cards, wireless headset, charcoal grill, electronic photo frame, fashionable New Orleans symposium bags and portfolios) donated by InCompliance, ReliantEMC and Caroline Chan with the EMC Society.

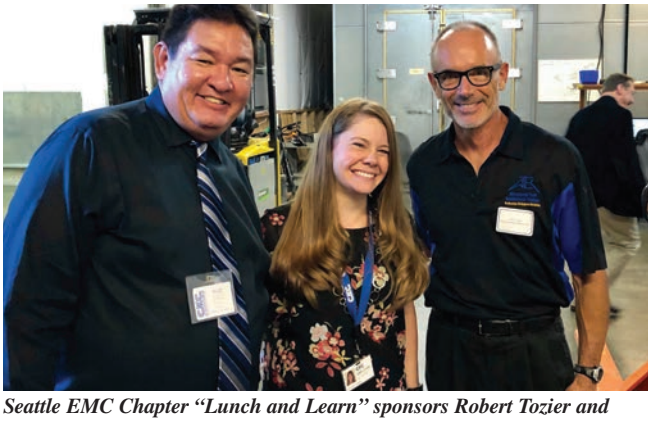
We would like to thank the 22 exhibitors that supported the event, including The EMC Shop, Advanced Test Equipment Rentals, TOYO Corporation, Avalon Test Equipment, Amber Precision Instruments, Pearson Electronics, NTS, Amplifier Research, Techmaster Electronics, CKC Labs, Advanced Technical Sales, ETS-Lindgren, Gauss Instruments, Haefely Hipotronics, HV Technologies, InCompliance, Reliant EMC, SteppIR, Fair-Rite Products Corp., Leader Tech, and WEMS. Thank you also to Rohde & Schwarz who loaned their scope for the ESD demonstration.

Seattle

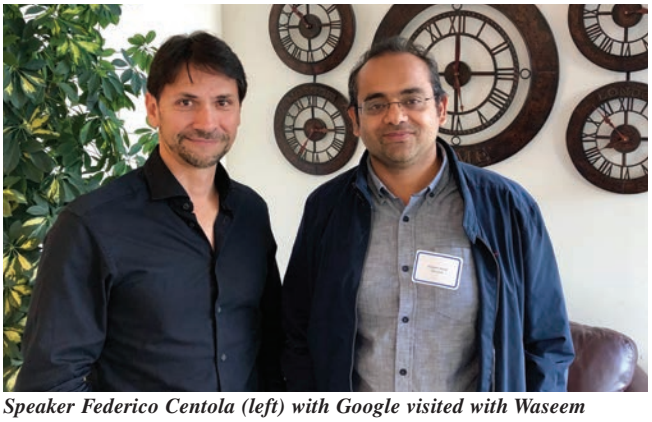
The IEEE Seattle EMC, MTT/AP/ED, and VT/ComSoc Chapters held a joint "Lunch and Learn" meeting on September 18, 2019 at CKC Labs in Bothell, just north of Seattle. This was a hands-on event addressing fundamental to advanced EMC design and test topics – complemented by live demos! The event started with a complimentary lunch hosted by Advanced Test Equipment Rentals and a tour of CKC Labs. There were many new chambers to see on the tour as CKC Labs has expanded their test capabilities to include environmental testing! Following the tour led by Robert Tozier of CKC Labs, we had two presentations. The first presentation was by Federico Centola of Google on EMC design topics. The second presentation was by Dennis Lewis of Boeing on EMC test topics. Dennis then conducted the live demonstrations using the reverb chamber at CKC Labs.

Federico Centola, Lead EMC Designer with Google in Mountain View, California joined us to present "Automated Design Rule Check for EMC Design". The Seattle Chapter officers had seen a write up of this presentation in Chapter Chatter from a previous issue of the EMC Magazine and thought it would be a good fit for the engineers in the greater Seattle area. Federico graciously traveled to Seattle to provide this great presentation on the EMC design of PCBs. He noted this often requires board reviews and inspections to ensure that EMC guidelines are followed and that there are no major EMC design violations. This review process is very often a manual process, time consuming and prone to errors especially when large PCBs with multiple layers have to be examined. Federico showed us that while automated Design Rule Checking (DRC) tools have been available for years, they are not always used because the set-up time may also be very time consuming and because the results usually contain many non-critical violations. He discussed the utility of DRC for EMC, possible ways of automating the process and the importance of having customized rules and design parameters.

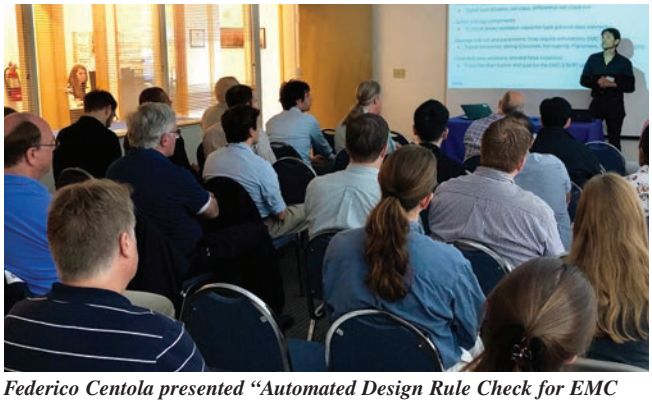
Next, Seattle EMC Chapter Chair Dennis Lewis, Technical Fellow with Boeing in Seattle, Washington, presented "Utilizing Reverberation Chambers as a Versatile



Seattle EMC Chapter "Lunch and Learn" sponsors Robert Tozier and Katherine Helgeby with CKC Labs and Kevin Croppo (from left) with Advanced Test Equipment Rentals contributed to the success of the event.

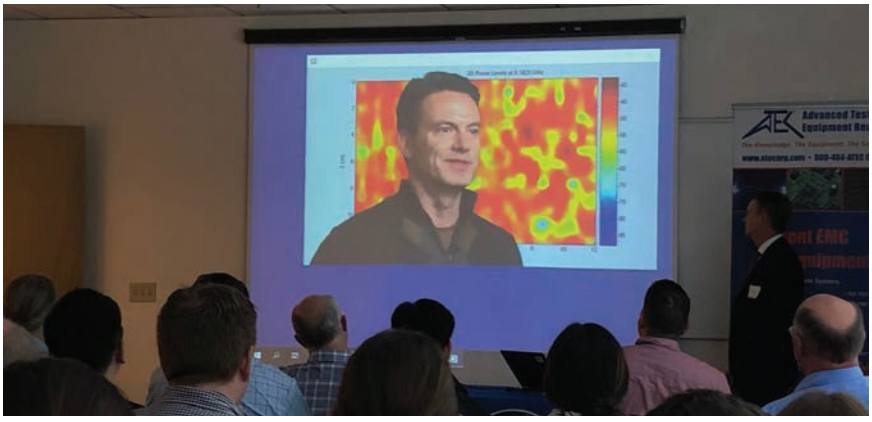


Speaker Federico Centola (left) with Google visited with Waseem Ahmad with Microsoft prior to his presentation at the Seattle EMC Chapter meeting on September 18.



Federico Centola presented "Automated Design Rule Check for EMC Design" during the "Lunch and Learn" event held at CKC Labs in Bothell, Washington.

Speaker Dennis Lewis with Boeing gave the second presentation on "Utilizing Reverberation Chambers as a Versatile Test Environment for Assessing the Performance of Components and Systems".

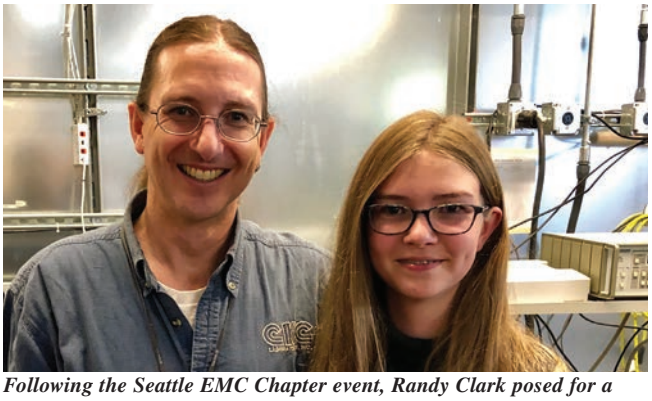


An entertaining part of Dennis's presentation was viewing a video that shows how Boeing engineers (namely, Dennis Lewis and Kenny Kirchoff) used potatoes to improve in-air Wi-Fi. You can find it on line if you Google "Boeing" and "SPUD".

Test Environment for Assessing the Performance of Components and Systems". Dennis noted that electromagnetic reverberation chambers have been used for many years by the EMC community to measure the susceptibility and emissions for various electronic components and systems. He described how statistical processes have been used to reduce the uncertainty of these chambers to a level necessary for precision metrology applications. These processes were applied to the calibration of electromagnetic field probes and the assessment of antenna efficiencies. A comparison of traditional calibration methods employing transverse electromagnetic (TEM) cells and anechoic chambers to the new statistical reverberant environment was shown. Dennis also explained how these techniques were later applied to a wide variety of aircraft measurements. He shared information about a test technique that utilizes two side-by-side reverberation chambers sharing a common wall with an arbitrary shaped aperture, which is useful for the assessment of component shielding. Utilizing this same approach, Dennis noted it is possible to assess the shielding of large structures such as commercial aircraft. These aircraft shielding measurements are necessary for High Intensity Radiated Field Susceptibility (HIRF) certifications. With the proliferation of wireless devices, it is important to understand how they behave in complex electromagnetic environments and how they interact with other devices and systems in which they are collocated. Aircraft environments have been shown to behave similarly to reverberation chambers and therefore these techniques can be employed to study propagation environments and system interactions. Dennis provided examples of how these techniques were employed to measure bulk absorption used to simulate passenger loading of aircraft, field mapping which is useful for the evaluation of signal coverage and channel interference as well as signal propagation characteristics. He ended the presentation by showing a Boeing video on related R&D in this area. The video shows how Boeing

Following the presentations at the Seattle "Lunch and Learn" event, attendees went into the lab to see demonstrations. Dennis Lewis (center in far left photo) conducted the demonstrations. He showed how to identify and separate random and systematic components of reverberation chamber measurements. Attendees were very interested (center photo) and were able to see complex cavity measurements in both time and frequency domain (far right photo) thanks to the nice projection system set up by CKC Labs.

Randy Clark of CKC Labs (far left) shows the Seattle EMC Chapter "Lunch and Learn" attendees the layout of their reverberation chamber.



Following the Seattle EMC Chapter event, Randy Clark posed for a photo with his daughter Katherine. The Seattle Chapter officers appreciate her interest in EMC!

The IEEE EMC Sendai Chapter and Sendai Seminar on EMC of the Research Institute of Electrical Communication at Tohoku University organized a colloquium on November 8, 2019 at the Cyberscience Center of Tohoku University in Sendai, Japan.

engineers (namely, Dennis Lewis and Kenny Kirchoff) used potatoes to improve in-air Wi-Fi. You can find it on line if you Google "Boeing" and "SPUD".

Following the excellent presentations, Dennis and Robert took the meeting attendees into CKC Lab's reverberation chamber. There Dennis conducted the demos, which were of great interest to the some 50 meeting attendees. The demos were very interactive and generated many questions for which Dennis had the answers. It was a great learning opportunity to see hand's on measurements that complemented the presentations.

Many thanks to CKC Labs for providing the meeting space and to Advanced Test Equipment Rentals for providing the excellent catered lunch. Thanks also to our speakers for sharing their expertise with us. It was a great meeting!

Sendai

The Sendai EMC Chapter organized the 2019 IEEE EMC Society Sendai Chapter Colloquium held on November 8. This was a joint meeting with the Sendai Seminar on EMC of Research Institute of Electrical Communication at Tohoku University. The Colloquium featured two lectures covering innovative EMC topics presented by Dr. Katsumi Fujii and Dr. Teruo Tobana. The presentations covered such topics as basics of EMI measurement using S-parameters and electromagnetic characteristics in a printed circuit board. Fifteen attendees were present at the colloquium held at the Cyberscience Center of Tohoku University in Sendai, Japan.

Switzerland

On Wednesday, October 9, the joint EMC/AP/MTT Switzerland Chapter and the EMC Laboratory of the Swiss Federal Institute of Technology (EPFL) organized an IEEE EMC Society Distinguished Lecture by Dr. Ishan Erdin who discussed the fundamentals of and recent advances in Power Integrity (PI). Although Signal Integrity (SI) and power integrity practices are as old as digital design itself, unlike SI, PI remains as an elusive concept in the eyes of industrial circles. The lecture started with a quali-

On October 9, the joint EMC/AP/MTT Switzerland Chapter and the EMC Laboratory of EPFL organized an IEEE EMC Society Distinguished Lecture by Dr. Ishan Erdin who discussed the fundamentals of and recent advances in power integrity.

(From left) Antonio Sunjerga (EMC Laboratory EPFL), Nicolas Mora (IEEE EMC/AP/MTT Chapter Chair), Dr. Ishan Erdin (EMC Society Distinguished Lecturer), Prof. Farhad Rachidi, Qi Li, and Wenhao Hou (all with the EMC Laboratory at EPFL) attended the October 9 meeting in Switzerland.

On October 25, the joint EMC/AP/MTT Switzerland Chapter and the Microwaves and Antennas Group of EPFL organized an IEEE Antennas and Propagation Society Distinguished Lecture by Dr. Buon Kiong Lau.

Following the October 25 presentation, (from left) Ivica Stevanovic (Federal Office of Communications), Prof. Buon Kiong Lau (IEEE AP Distinguished Lecturer), Prof. Anja Skrivervik (Microwaves and Antenna Group EPFL), Nicolas Mora (IEEE EMC/AP/MTT Chapter Chair), and Danelys Rodriguez (Microwaves and Antenna Group EPFL) enjoyed a networking luncheon.

tative and descriptive introduction of power noise fundamentals and a review of the current analysis techniques for printed circuit structures, including their limitations with practical work-arounds. Some recent developments including a novel interpretation of the effective radius of a decoupling capacitor and multipin optimization of capacitors were presented on sample cases. The attendees included several Ph.D. students in EMC and Prof. Farhad Rachidi. The presentation was followed by a question and answer session during a networking lunch hosted by EPFL.

On Friday, October 25, the joint EMC/AP/MTT Switzerland Chapter and the Microwaves and Antennas Group of EPFL organized an IEEE AP Distinguished Lecture by Dr. Buon Kiong Lau. He discussed the fundamentals of and recent advances in antenna design for 5G networks. Massive MIMO, full-dimension (FD) MIMO, millimeter-wave and small cells are some popular candidates for the 5th generation (5G) wireless communication systems. However, as much as these technologies present exciting new challenges for antenna design, the conventional design framework is expected to remain, partly due to the current emphasis on non-antenna issues. The lecture started by giving an overview of conventional terminal antenna design and comments on its limitations. Then, current trends in terminal antenna design for 4G systems were outlined, and the new antenna design paradigm that has the potential to dramatically improve 5G performance were introduced. Finally, some practical techniques to take advantage of this design paradigm, where each technique offers promising performance gains over the state-of-the-art, were provided. The attendees included several Ph.D. students in EMC and Antennas, faculty members and representatives from the regulation office of communications in Switzerland. The presentation was followed by a question and answer session during a networking lunch hosted by IEEE.

Turkey

By organizing more than 60 distinct activities since the end of 2017, the Turkey joint AP/MTT/EMC/ED Chapter received the 2019 Most Improved Chapter Award from the EMC Society.

After the end of the summer, the Chapter continued its activities with a quite busy schedule involving a workshop sponsorship and eight seminars so far. The Chapter was a technical sponsor of "BEYOND 2019: Computational Science and Engineering Conference" organized at the Middle East Technical University, Ankara, Turkey. At the beginning of the workshop, a member of the local team, Şirin Yazar, made a speech on the activities of the Chapter, as well as on IEEE and its societies in general, to an audience that consisted primarily of mathematicians.

Seven of the organized seminars were technical and on a variety of topics (algorithms, RF applications, MEMS, visible light applications, stochastic control, cosmology, and MOSFET circuits), and attracted both undergraduate and graduate students. Following is a summary of the seminars:

11 October 2019

Speaker: Asst. Prof. Ercüment Çiçek, Bilkent University

Topic: "SPADIS: An Algorithm for Selecting Predictive and Diverse SNPs in Genome-wide Association Studies"

18 October 2019

Speaker: Prof. Ekmel Özbay, Bilkent University

Topic: "A Review of Turkish GaN HEMT Technology Activities for RF Applications"

25 October 2019

Speaker: Asst. Prof. Erdinç Tatar, UNAM, Bilkent University

Topic: "Finding Solutions to the MEMS Gyroscope Drift Problem"

1 November 2019

Speaker: Prof. Sinan Gezici, Bilkent University

Topic: "Fundamental Limits and Resource Allocation for Visible Light Positioning"

8 November 2019

Speaker: Asst. Prof. Naci Saldı, Özyeğinç University

Topic: "Non-signaling Approximations of Decentralized Stochastic Control Problems"

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- Advanced Antenna Measurement Techniques Using Time Domain Transformation
- EMC and Aerospace Antenna Calibration and Measurement Challenges
- Smart Antennas: Technology Integrating Antennas, DSP, Communications and Networks

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ENGINEERS AUSTRALIA

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15 November 2019

Speaker: Prof. Bayram Tekin, Middle East Technical University

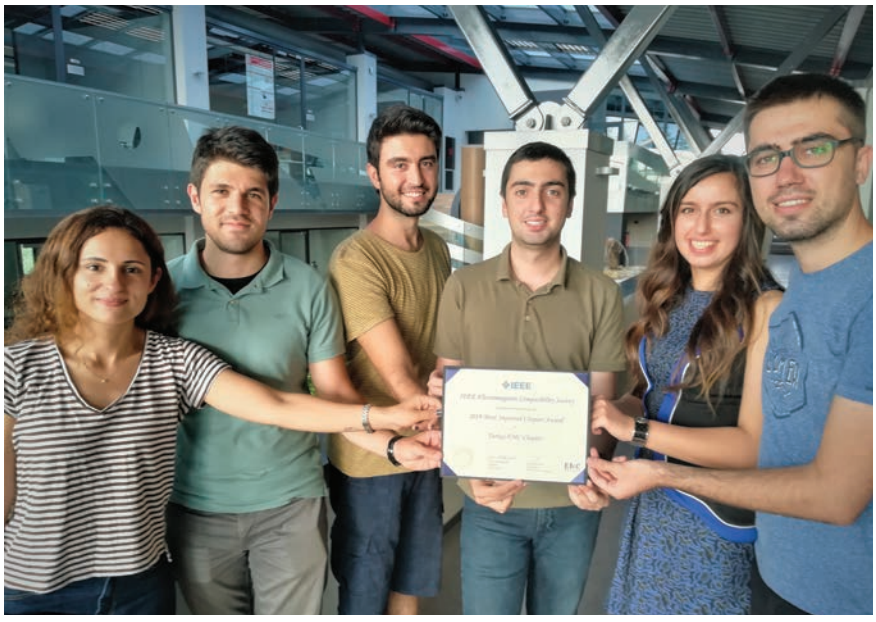
Topic: "A Panoramic View of Modern Cosmology"

29 November 2019

Speaker: Prof. Alper Demir

Topic: "Nonstationary Low Frequency Noise in Switched MOSFET Circuits and Circuit Simulation"

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



The joint AP/MTT/EMC/ED Turkey Chapter team members are very proud to have received the 2019 EMC Society Most Improved Chapter Award.

The Turkey Chapter was a technical sponsor of "BEYOND 2019: Computational Science and Engineering Conference" organized at the Middle East Technical University, in Ankara, Turkey.

At the BEYOND 2019 Conference, Şirin Yazar with the Turkey Chapter team made a speech about the IEEE and the activities of the local Chapter.

Prof. Ekmel Özbay with Bilkent University presented "A Review of Turkish GaN HEMT Technology Activities for RF Applications" at the Turkey Chapter meeting on October 18.

Prof. Sinan Gezici with Bilkent University presented "Fundamental Limits and Resource Allocation for Visible Light Positioning" at the Turkey Chapter meeting on November 1.

Prof. Bayram Tekin with Middle East Technical University presented "A Panoramic View of Modern Cosmology" on November 15.

The Turkey Chapter organized a professional seminar on engineering and entrepreneurship by Ufuk Batum.