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EMC Hardware Experiments and Computer Software Demonstrations at EMC 2007

By Colin Brench and Andrew Drozd

Colin Brench (left) and Andy Drozd ably co-chaired the popular “Experiments and Demonstrations” component of the annual symposium presented this year at EMC 2007.

Every slot was filled in the Experiments and Demonstrations section of the 2007 IEEE International Symposium on EMC in Hawaii this past summer, with a total of 13 hardware experiments and seven computer software demonstrations. We saw some first-time presenters as well as several of our popular, more experienced presenters. Overall, this section of the annual symposium, now in its 15th consecutive year, once again proved to be a highly successful event.

Both the hardware experiments and computer-based

demonstrations were conducted in parallel over a 2-day period, where each emphasized some fundamental aspect of EMC, EM coupling phenomena and effects, or practical methods of EMI measurement and trouble-shooting. This section of the symposium is sponsored by the Education and Student Activities Committee (ESAC) of the IEEE EMC Society with the goal of being an educational tool to help understand EMC by using examples and problems that are often encountered in our day-to-day work. Since we first started these demonstrations,

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Jerry Meyerboff (standing far left) of Continental Automotive Systems questions presenter Patrick Webb (far right) of National Instruments following his demonstration on radiated emissions.



Jeff Evans (right) of Hewlett Packard presents “Various Methods for Measuring Surface Contact Resistance/Impedance on Sheet Steel.”

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Dr. Lauri Halme (center) traveled from the Helsinki University of Technology in Espoo, Finland to Hawaii to present “Measurement of the Shielding Effectiveness of Feedthroughs and EM Gaskets up to 4 GHz and Above.”



When he wasn't busy taking photos during EMC 2007, Ken Wyatt (left) of Agilent presented “EMC Troubleshooting Techniques.” Tom Van Doren of the University of Missouri – Rolla appreciated Ken's comprehensive presentation.

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problems have become more complex, as have their solutions. Yet, these demonstrations still provide excellent opportunities for closely examining the EM phenomena, physics, and mechanisms underlying EMI coupling including methods for mitigating interference.

This year's hardware demonstrations were organized by the team of Colin and Bonnie Brench. Thirteen presenters offered their knowledge, experience, and talents to a receptive crowd. We had three international presenters, each drawing quite a crowd:

Path of Least Inductance by **Elya Joffe**, Senior EMC Engineering Specialist and Consultant, and V. P. of Engineering at K.T.M. Project Engineering in Kfar-Sava, Israel.

Motor Driven Air Intake Flap Grounds NATO AWACS Aircraft by **Norbert Kohns** at the NATO Airbase in Geilenkirchen, Germany.

Measurement of the Shielding Effectiveness of Feed-throughs and EM Gaskets up to 4 GHz and Above by **Dr. Lauri Halme**, Specialist Lecturer in the Communications Laboratory at the Helsinki University of Technology in Espoo, Finland.

From the mainland U. S., we had a variety of demonstrations ranging from EMI measurements and testing, to the effects of

ESD and lightning:

RF Electric Field Probes and their use in EN61000-4-3 Radiated Immunity Testing by **David Seabury**, Senior Product Manager of EME Measurement Devices at ETS-Lindgren in Cedar Park, Texas.

Mitigating the Effect of ESD on a Timing Circuit by **Oscar Mahin Fallah** at Cisco Systems in San Jose, California.

Various Methods for Measuring Surface Contact Resistance/Impedance on Sheet Steel by **Jeff Evans** at Hewlett-Packard in Roseville, California.

Accurate Measurement and Identification of RFI by **Patrick Conway** at Hewlett-Packard Company in Houston, Texas.

Practical EMC Filtering by **Dave Arnett** at Hewlett-Packard Company in Vancouver, Washington.

A particularly interesting and startling lightning demonstration was given by Fred Heather:

Aircraft Lightning Attachment and Radiation Hazards to Personnel by **Fred Heather**, Joint Strike Fighter (JSF) EM Environmental Effects Lead at the U. S. Naval Air System Command in Patuxent River, Maryland

The following four presenters joined us again this year with some new hardware demonstrations:

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Bruce Archambeault (left) of IBM readying his presentation "Using FDTD for Real-World EMC Simulation" with the assistance of EMC 2007 Experiments and Demonstrations co-chair Colin Brench.

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Darryl Beetner (center) of the University of Missouri – Rolla returned to the experiments and demonstrations format this year presenting "Evaluation of TEM Cell Measurements" to an intent audience.

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C. J. Reddy of EM Software & Systems participated in the computer modeling and simulation demonstrations. This was a repeat visit for Dr. Reddy who is a popular participant in this program.

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John Norgard (standing) of the U. S. Air Force Research Laboratory in Rome, New York, and the U. S. Air Force Academy in Colorado Springs, Colorado shared his expertise with his presentation on "IR Images of EM Fields."

Introduction to Time Domain Measurements by **Dr. Michael Foegelle**, Director of Technology Development at ETS-Lindgren in Cedar Park, Texas.

EMC Troubleshooting Techniques by **Ken Wyatt**, Senior EMC Engineer at Agilent Technologies in Colorado Springs, Colorado.

Getting the Most Accurate Radiated Emissions Representation by **Patrick Webb** at National Instruments in Austin, Texas.

Evaluation of TEM Cell Measurements by **Daryl Beetner** at the University of Missouri-Rolla in Missouri.

Running in parallel with the hardware demonstrations was this year's agenda of seven computer modeling and simulation demonstrations, organized by Andy Drozd. Two of these demonstrations were performed by first-time presenters, including:

Effective Mitigation of Power-Bus Resonance Using Thin Layered Material: Solved by Modal Analysis by **Sungtek Kahng** of the University of Incheon in Korea.

IC-EMC, A Demonstration Freeware for Predicting Electromagnetic Compatibility of Integrated Circuits by **Alexandre Boyer** and **Etienne Sicard** of the Institut National des Sciences Appliquées (INSA) of Toulouse in Toulouse, France.

Andy also brought back many of our experienced presenters: *Using FDTD for Real-World EMC Simulation* by **Bruce Archambeault** of IBM Corporation in Research Triangle Park, North Carolina.

IR Images of EM Fields by **John Norgard** of the U. S. Air Force Research Laboratory in Rome, New York, and U. S. Air Force Academy in Colorado Springs, Colorado.

Modeling Potential EMI of On-Board Anti-Collision Radar and External RF Communications Devices Mounted on Intelligent Transportation System Vehicles by **Irina P. Kasperovich** of ANDRO Computational Solutions, LLC in Rome, New York.

Electromagnetic Bandgap Structures (EBGs) Design by Means of FIT by **Antonio Ciccomancini Scogna** of CST of America, Inc. in Wellesley Hills, Massachusetts.

Combination of MoM/MLFMM/PO/FEM with Transmission Line Theory for the Analysis of External Field Coupling into Shielded Cables by **Robert Kellerman** and **C. J. Reddy** of EM Software & Systems of Hampton, Virginia.

These demonstrations highlighted fundamental EMC modeling approaches and simulation methods applied to EMI troubleshooting and problem solving. Various computational EM modeling techniques were applied to simple canonical models

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All smiles following his presentation titled "RF Electric Field Probes and their use in EN61000-4-3 Radiated Immunity Testing" were speaker Dave Seabury (left) of ETS-Lindgren and Tim Peterson of Agilent.

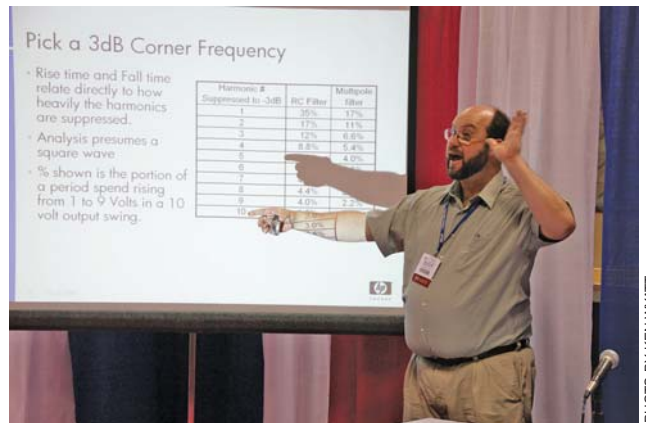


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Dave Arnett of Hewlett Packard in Vancouver, Washington enthusiastically presented "Practical EMC Filtering" at EMC 2007.

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First time presenter Sungtek Kahng of the University of Incheon in Korea provided a computer demonstration titled "Effective Mitigation of Power-Bus Resonance Using Thin Layered Material: Solved by Modal Analysis."



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Fred Heather (standing far left) of the U. S. Naval Air System Command in Patuxent River, Maryland provided the lively experiment "Aircraft Lightning Attachment and Radiation Hazards to Personnel" to a standing room only crowd.



Bonnie and Colin Brench were a great team in coordinating the demonstrations and experiments at EMC 2007. Once the stations were set up at the Hawaii Convention Center, they relaxed at the Tuesday evening "Welcome Reception."

as well as more sophisticated models in order to show how specific EMC problems can be resolved. The computer demonstrations further showed how modeling and analysis could be an effective means of identifying and mitigating EMI problems, as a complement to EMC design and measurement.

Behind the scenes were our equipment suppliers and their

crews. Supplying the frequency domain instruments (EMI receivers, signal generator, vector network analyzer, and an assortment of small equipment, cables, and adapters) this year was Rohde & Schwarz. As a few of their analyzers were top-of-the-line new models, they also provided us with Danny Bennett whom we are indebted to for patiently sitting down with many of our presenters to provide operation instruction and, in one case, sat through a whole presentation helping to run the new network analyzer.

Agilent graciously supplied all of the time domain instruments (oscilloscopes, LNA, power supplies, and a function generator). We especially want to thank Ken Wyatt of Agilent for pulling out all stops to obtain this equipment for us.

We also must thank several individuals who stepped up to the plate to supply a few extra items. These generous presenters were Ray Adams, Fischer Custom Communications – current probe, Ken Wyatt, Agilent – near field probes, Norbert Kohns, NATO – AC power supply, Jeff Evans, Hewlett Packard – milliohm meter and multi-meter, Colin Brench, HP – multi-meter, and ETS-Lindgren – field probes.

We also very much appreciated the Hawaii Convention Center and its AV supplier for setting up the LCD projectors and screens, as well as microphones and speakers, for each of the four stations. A friendly and helpful technician kept everything running smoothly for us. EMC

Vows Renewed



The day before leaving Honolulu, EMC Society Photographer Ken Wyatt (far right) surprised his wife Sheila with a vow renewal ceremony on Magic Island (near Waikiki) just prior to sunset. The ceremony ended with a real rainbow over Waikiki Beach as seen just behind them. The Christian ceremony was conducted in English and Hawaiian, then the pastor and his wife sang the Hawaiian Wedding Song. Happy 30th Wedding Anniversary to Ken and Sheila!

New Members of the EMC Society Board of Directors Announced!

As you know, a ballot for the election of six members to the IEEE Electromagnetic Compatibility Society Board of Directors was issued on 20 August 2007. The ballots returned have been counted, and the following candidates have been elected for a three-year term beginning 1 January 2008:

Colin Brench
Robert Davis
Fred Heather
Randy J. Jost
Francesca Maradei
Mark I. Montrose

We wish the newly elected members of the Board of Directors success and thank all candidates for their willingness to serve and for permitting their names to be included on the ballot.

Brief biographies of these candidates will be featured in the next issue of the EMC Newsletter.