Worldwide microwave community to convene in Baltimore for IMS2011

Rick Nelson - May 18, 2011

The 2011 MTT-S International Microwave Symposium will commence June 5 in Baltimore, with this year's theme "Microwaves for the World" emphasizing microwave technology's global importance. The symposium will cover the gamut of RF/microwave application areas, including radar, medical imaging, biological analysis, millimeter-wave communications, wireless transfer of RF power, 4G cellular-system deployment, RF superconductivity, terahertz and optical-frequency communications, and RFID technology. Special sessions will also recognize contributions of the international community of researchers to RF and microwave innovation.

Sessions and interactive forums of particular note for the test-and-measurement community include "Broadband measurement techniques," "Advances in low-noise IC design and measurements," "Advanced circuit and material measurement," and "Using X-parameters to model diode-based RF power probes."

To learn more about this year's symposium and related Microwave Week events, Test & Measurement World spoke with Ramesh K. Gupta, Chair of the IMS2011 Technical Program Committee (TPC).

The theme this year is Microwaves for the World, and, according to the advance program, two focus sessions titled "Microwaves around the World" will feature presenters from China, India, Malaysia, Ukraine, Lithuania, Turkey, Egypt, and Brazil. Could you very briefly describe the specific, unique activities of one or two of these presenters?

The IMS2011 theme, "Microwaves for the World," emphasizes the fact that RF, microwave, and millimeter-wave research and development continues to enrich the lives of people around the globe. Most of the people around the world identify microwaves with common household item—microwave ovens. Clearly, there is a whole lot more. I think a great example is how RF and microwave technologies have been key enablers for the wireless/cellular communications, where today the growth is largely driven by emerging markets like India and China.

To be consistent with our theme, we wanted to recognize the global nature of the microwave community and the increasing collaboration between different regions of the world. We identified regions that are normally under-represented at the symposium but are very important to the emerging global society. We solicited papers from a group of speakers for two "Microwaves around the World" focus sessions that could showcase microwave research in these regions of the world that represent almost 40% of the world population.

To expand on what attendees may hear, the presentation from India, for example, will span contributions from the region, including first demonstrations of millimeter waves by J.C. Bose, and it
will describe the microwave technologies supporting telecommunication growth trajectory in India. The presentation from China will address Terahertz (THz) research and the components being developed there. Another presentation from China will address issues related to manufacturing of printed circuit boards that are increasingly being used for high-frequency applications.

With respect to papers accepted for the technical program, have you noticed a shift in subject matter compared with previous years, and if so what topics are receiving the most attention?

We have noticed several trends that are quite consistent with the state of microwave technology and the microwave industry. We see there is an increased emphasis on achieving better power efficiency and linearity using novel devices and circuit techniques and on improving spectral efficiency with advanced and flexible modulation schemes. We also see use of efficient DC power management using a system approach—in other words, techniques to use the DC power more efficiently. We also notice a trend towards direct analog-to-digital and digital-to-analog conversion at frequencies exceeding 1 GHz, and that is quite important for the test-and-measurement industry.

We expanded the scope of the symposium by soliciting papers in emerging technical areas. The idea here is to let the contributors decide what areas should be presented at the symposium, a trend that was started at IMS2010. This year we have added two technical areas, which include RF nanotechnologies and efficient wireless transfer of power. We also permanently added two technical areas that were identified last year-RFID technologies and systems, and industrial applications of high-power microwaves.

The May issue of IEEE Microwave has IMS preview articles on MRI, photonics for RF front ends, power combiners/dividers (from China), RF and microwave engineering in India, and microwave sensors (from Eastern Europe and the Middle East). Would you like to highlight any other particularly interesting topics being covered this year?

I think that the attendees will find the whole technical program at the symposium very interesting. We are very proud of it, and the technical program committee has worked extremely hard to bring it all together. We just didn't have enough space in the May issue of IEEE Microwave to cover all the topics.

For starters, our plenary presentation on Monday, "Migration of WCDMA and 4G LTE into Existing Cellular Bands" by Professor J. David Rhodes, will be extremely exciting. We will also have a special session on 100 years of superconductivity and a session on historical perspectives on microwave development in the Baltimore and Washington, DC, area. Other sessions will address microwave technologies for space applications, GaN and LDMOS linear power amplifiers, RF MEMS, and ultra-low-power transceiver architectures. Those are just a few—there are a lot more sessions and each one is unique and exciting topic in its own right.

What is the mix of papers from academia vs. industry, and has the economic downturn seemed to depress industry participation?

We think the IMS2011 technical program is very well balanced, with approximately 60% of the papers from universities and the remaining 40% or so from industry and government labs. When you consider the fact that the university research is many times sponsored by government and industry, the symposium technical program has a great balance between university, government, and industrial research. That is to be expected, as much of the in-depth analytical work comes out of the universities, and much of the device and component work comes out of industry.
The number of papers that were submitted and number of papers being presented is almost same as last year. The number of papers to be presented is more than twice that of the 1986 Symposium, held in Baltimore 25 years ago.

**Have you seen a notable shift in submissions for consumer-oriented wireless/RF topics vs. military/aerospace and other topics?**

I think it’s fair to say that much of the growth in paper submissions over the last few years is driven by commercial applications—specifically the unprecedented growth in the wireless industry. The military and aerospace segments also have had a steady growth. Also, we recognize that more and more military and aerospace systems are using commercial off-the-shelf devices and modules to the extent possible.

**A focus session on Wednesday addresses computational microwave engineering with an emphasis on time-domain modeling. Is there an increasing need for time-domain modeling, and if so, what is driving that need (perhaps the availability of sufficient computational power to run the models)?**

The key drivers, I believe, are the availability of additional spectrum leading to millimeter-wave and optical-frequency applications and continuing miniaturization of devices and systems, requiring sophisticated modeling leading to first-pass success. In addition, the exponential increases in available computational processing power and novel computational techniques make it possible to model some very challenging problems and applications.

**In addition to IMS2011, the technical program of Microwave Week includes the Radio-Frequency Integrated Circuit Symposium and the Automatic Radio-Frequency Techniques Group Conference. How do the presentations in these events compare with the core IMS technical program?**

We like to view the Microwave Week as actually three conferences wrapped into one. The technical programs at RFIC and ARFTG complement the IMS2011 program, with emphasis on device and chip-level design at RFIC, and on test-and-measurement issues in ARFTG. We have worked very closely with technical program committees of both of these symposia and carefully coordinated the technical and Workshop program to make sure we have minimum overlap. We think RFIC and ARFTG have very high quality papers that fully complement the core technical program at IMS2011.

**A panel on Tuesday will address multiple-radio integration on a single die or within a single package. Is this multiple-radio approach winning out over the software-defined radio approach—in which a single radio reprograms on the fly to accommodate the frequencies and modulation schemes of the RF environment in which it finds itself?**

This will be a very interesting panel session that will attempt to answer questions you have raised. We believe that the integration of multiple radios on a chip brings a number of challenges, which include the need to support additional frequency bands while maintaining compatibility with existing and new standards. The front-end technology becomes critical because of required performance coupled with size and cost issues. The panel will address these issues and also the level of integration that makes sense from performance and cost point of view. The session is therefore appropriately titled "What is the limit of multi-radio integration...or rather, is it disintegration?" We also have a separate workshop on software-defined and cognitive radios.

**Have you found increased interest in the student paper competition this year compared**
Absolutely! We had approximately 190 student papers that were submitted, and we had each of the review subcommittees recommend no more than one for the final student competition. We now have 25 high-quality papers that will go into the student paper competition.

Also, we have enhanced our student competition this year by adding a "Graduate Student Challenge," where graduate-student teams will register for the challenge and attend different IMS2011 technical sessions. They will form teams, brainstorm, and develop new ideas and applications based on papers presented at the symposium and make presentations to a panel of judges on the last day of the symposium. The winning team will earn a $2000 prize.

In addition to that we have student design competition that we have enhanced significantly. We announced the competition in August 2010 before the school year started. We had different technical committees of MTT-S propose various topics, and we have chose seven areas in which students will compete with a design project. The competitions are much larger than in previous years. RF and microwave technology it is much needed for the future. We want to promote the competition and encourage students to study RF and microwave technology and thus hopefully help develop future leaders for the industry.

How do the interactive forums on Wednesday differ from the panel discussions?

The interactive forums are contributed papers which the paper review committee considers more appropriate for one-to-one interaction. These papers meet the same standard of acceptance as other technical papers, but they are more appropriate for oral presentation to smaller groups, and they also provide the opportunity for the presenters to demonstrate some of the hardware live as they are presenting. Panel discussions focus on controversial topics, where we invite experts and try to get them to formulate an outcome based on differing points of view. Panel sessions tend to be very exciting, very controversial, and extremely interactive.

I notice there are several tribute sessions this year.

IMS has a tradition of honoring those colleagues and pioneers who made significant contributions to MTT-S and, unfortunately, passed away during the year. This year there are three memorial sessions planned honoring three great individuals who were key pillars of the society, and they deserve recognition and our full respect. Theodore Saad was one of the founders of the MTT society, in the early 1950s. Roger Sudbury served as MTT-S president and also as an IEEE division director. Professor Nathan Marcuvitz contributed to the development of microwave radar at MIT doing World War II and also authored a classic Waveguide Handbook that is still in use today. They will be sadly missed at IMS2011 and we will celebrate their lives with special memorial sessions, reviewing their work and contributions.

Are there any other points you would like to emphasize about IMS2011?

Our objective this year has been to enhance the scope of the symposium and also to improve interactivity. We wanted to create a symposium that is inclusive and participatory and also fosters a global perspective. We have made an effort to provide sufficient time for attendees to participate in an exciting technical program while providing them ability to network with each other. We have also asked the organizers for each workshop to use 20% to 25% of time for audience interaction. We have designed a symposium that will appeal to students, novices, and practitioners as well as to researchers advancing the state of the art. Baltimore offers a unique venue for the symposium and
we have an excellent social program, which includes a crab feast on Thursday. We will have a vibrant exhibition that is attracting close to 600 companies from around the world.

We look forward to welcoming the attendees at IMS2011.

Interview conducted and edited by Rick Nelson.

For more information and to register visit www.ims2011.org.