Feb 2016 Newsletter
The IEEE Reliability Society
Joint Section Chapter: Boston - New Hampshire - Providence
Dec 2016 – Feb 2016
http://www.ieee.org/bostonrel

First and foremost, I'd like to wish all of you a very happy and prosperous 2016. In December 2015, at our Past Chairs' Dinner, we took a historical look at the Chapter's leadership, from Irv Bosinoff in 1960, H. Elmore Blanton in 1961, Charlie Saraglow in 1965, Avery Hevesh in 1969, etc., up to present day. With a 55 year history, the Boston Chapter continues to provide New England reliability professionals with peer-to-peer networking access and technical continuing education at our monthly meeting series.

Two former Boston IEEE Reliability Chapter members, Aaron DerMarderosian, Jr and Lou Gullo, were co-awarded the IEEE Reliability Society's coveted Reliability Engineer of the Year Award for 2015. Aaron was able to join us for the December Past Chairs' Dinner, where he was presented with a certificate honoring this achievement, in advance of the IEEE Reliability Society Awards Banquet held at the scenic Loews Ventana Canyon in Tuscon, Arizona last month. Congratulations Lou and Aaron!

Lastly, I would welcome all of you to consider volunteering in the Chapter. There are multiple opportunities to contribute and support activities in a variety of roles. One way to express interest would be to click on the "Get Involved in Activities" link on the left hand side of our home page, which I typically navigate to by Googling "Boston Reliability". Another simple way would be to approach me and/or other Officers or AdCom members and get involved.

Warm Regards

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Recent Activities:

Dec 9, 2015	Chapter's annual past chairs dinner and monthly meeting. The past chairs dinner recognizes past chairs of the IEEE Boston Reliability Chapter for their years of dedication and contributions to the chapter. This meeting included social networking, followed by dinner and announcements. "Reliability as Impacted by Breakthroughs in Phased-Arrays and Radars – An Update" by Dr Eli Brookner at MIT Lincoln Laboratory, Lexington, MA.
January 13, 2016	"Reliability Growth Test Planning and Data Analysis: What are the Real Final Results?" by Milena Krasich is a Senior Principal Systems Engineer in Raytheon Integrated Defense Systems at MIT Lincoln Laboratory, Lexington, MA.

Upcoming Events:

Visit http://www.ieee.org/BostonRel to register

Feb 10, 2016	"ESD Device Sensitivity Trends and their Impact on Manufacturing Technology" by Dr. Terry L. Welsher, Dangelmayer Associates, held jointly with NE-ESDA at Lincoln Laboratory, Lexington, MA.
March 9, 2016	"ReliAbility PhySics based On Dynamic causal nEtworks (RAPSODE)" by Dr Simone Bortolami, Draper Laboratory, held at MIT Lincoln Laboratory, Lexington, MA.
April 14, 2016	"Infrastructure for Rapid Assessment of Reliability: Infrastructure and process improvements in the reliability testing of a high density microelectronic packaging technology" by Hannah Varner, Draper Laboratory, held at MIT Lincoln Laboratory, Lexington, MA.
April 29, 2016	"Nuclear System Control Reliability" by Mikhail Yastrebenetsky, Gnedeko Forum, held jointly with ASA and INFORMS, Northeastern University, Boston, MA.

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"Reliability as Impacted by Breakthroughs in Phased-Arrays and Radars – An Update" December 9, 2015 Dr. Eli Brookner retired Raytheon Co presented on the following topics.

Systems: Patriot to now have GaN active electronically scanned array (AESA) providing 360o coverage, a 2015 state-of-the-art system providing better performance and reliability; Ship borne S/X-band AMDR AESA radar system will provides 30 times the sensitivity and number of tracks as SPY-1D(V) and better reliability; JLENS aerostat radar system now deployed over Washington DC

Low Cost, Low Power Extreme MMIC (Moore's law at Microwave and mm-waves): 4 T/R modules on single chip at X-band costing ~$10 per T/R module ; Full 32-element 60 GHz Tx/Rx phased array on single chip; on-chip built-in-self-test (BIST); these will be used in the internet-of-things and in cell phones which by 2020 is expected to number 50 billion; All the RF circuitry for mm-wave automobile radars at 25 GHz and 77 GHz are being put on a single chip with some believing that such arrays and radars will soon cost just a few dollars. Materials: GaN 38% less costly than GaAs, 100 million hr MTBF, GaN can provide 5X to 10X the power of GaAs in same footprint, now some GaN power transistors less costly than their Si counterparts.

Digital Processing and Moore's Law: Not dead yet; Slowed down but has much more to go; Expect increase in transistors density by about a factor of ~50 in the next 30 years and reduction in signal processing power consumption by factor of ~75; and then there is graphene which has potential for terahertz transistor clock speeds, manufacture on CMOS demonstrated, could allow Moore's law to march forward using present day manufacturing techniques; there is also spintronics which could revolutionize the computer architecture away from the John von Neumann model, potential to replace hard drive with low cost, more reliable memory having no moving parts and faster access time for data; and then there is potential of doing computations the way the brain efficiently and amazingly does, going analog by perhaps using synaptic transistors and/or memristors, remember the brain only weighs about 2-3 pounds and uses only ~20 W, we have a long way to go.

Electrical and Optical Signals on Same Chip: Electricity and light have been simultaneously transmitted over a silver nanowire placed over single layer 2D MoS2, could be a step towards transporting on computer chips digital information at the speed of light; alternatively could use IR beams in a Si chip, which is transparent to IR, without ohmic loss.

COSMOS: DARPA revolutionary MMIC program: Allows integration of III-V, CMOS and opto-electronics on one chip without bonded wires leading to higher performance, lower power, smaller size, components.

Digital Beam Forming (DBF): Israel, Thales and Australia AESAs have an A/D for every element channel; Raytheon developing mixer-less direct RF A/D having >400 MHz instantaneous bandwidth, reconfigurable between S and X-band.

Metamaterials: Material custom made (not found in nature): Using 20 and 30 GHz metamaterial electronically steered antennas about the size of a laptop demonstrated December 2013 the transmission to satellites and back, goal is $1K per antenna, remains to prove low cost and reliability; 2-20GHz stealthing by absorption simulated using <1 mm coating; target made invisible over 50% bandwidth at L-band; Focus 6X beyond diffraction limit at 0.38 μm; The Army Research Laboratory in Adelphi MD has funded the development of a low profile metamaterial 250-505 MHZ antenna having a $\lambda/20$ thickness Technology and Algorithms: A low thickness, low profile wideband antenna can also be built using tightly coupled dipole antennas (TCDA); Lincoln Lab increases spurious free dynamic range of receiver plus A/D by 40 dB.

MIMO (Multiple Input Multiple Output): Where it makes sense; contrary to what is claimed MIMO array radars do not provide 1, 2 or 3 orders of magnitude better resolution and accuracy than conventional array radars; MIMO does not provide better rejection of barrage-noise-jammers, repeater-jammers or hot-clutter jammers than conventional array radars; airborne MIMO radar does not provide better minimum detectable velocity (MDV) than conventional radar.

Low Cost Packaging: Raytheon, Rockwell Collins and Lincoln-Lab and MA-COM are developing low cost X- and S-band flat panel AESA arrays using COTS type printed circuit boards (PCBs) Bio-degradable Array of Transistors or LEDs: Imbedded for detecting cancer or low glucose; can then dispense chemotherapy or insulin; New Symmetry Breaking Theory: Could allow in future placing small low frequency antennas on a chip; Quantum Radar: See stealth targets.

Dr. Brooker also presented a travelogue and photos from his latest travels to Turkey, China, and Papua New Guinea.

"Reliability Growth Test Planning and Data Analysis: What are the Real Final Results?"

On January 13, 2016 Milena Krasich Senior Principal Systems Engineer in Raytheon Integrated Defense Systems presented on Reliability growth of hardware through test and analysis has been a valuable industry tool for improvement of reliability of products for several decades. To provide a measure of this improvement, several mathematical models have been developed. Two of the well-known models for planning and monitoring of reliability growth are Duane, known as graphical methodology, and AMSAA /CROW, known as analytical model. Regardless, the fact is that the two models are based on the same principle, but contain a serious error in planning of the test duration and consequently in test data analysis, reporting of the results, and the measure of reliability improvement. The presentation will show how this mathematical — and also theoretical — error, unaddressed for decades, leads to incorrectly planned test duration and unrealistic overestimate of achieved reliability improvement.

Link to presentation

Link to past presentations http://ewh.ieee.org/r1/boston/rl/presentations.html

Chapter Participation and Outreach Efforts

I. Chapter Seeks Volunteers

We are interested in having you help out as a volunteer contributing as much or as little as you would like. We have a good team of volunteers that help us keep things going, so if you would like to join us, there is probably ample opportunity to choose how you would like to contribute. Email or talk to any of us at the next monthly presentation, or attend one of our Advisory Committee meetings.

For updates on upcoming events: http://ewh.ieee.org/r1/boston/rl/events.html.

Readers can contact chapter newsletter editor Ken Rispoli at kenneth_rispoli@hotmail.com) with any comment/suggestion or if interested in contributing to our next issue. Thanks.

The IEEE Reliability Society Joint Section Chapter
Boston - New Hampshire - Providence
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