



**The IEEE Reliability Society**  
**Joint Section Chapter: Boston - New Hampshire - Providence**  
**November 2014 – February 2015**  
<http://www.ieee.org/bostonrel>

Greetings,

We had outstanding presentations with solid attendance to finish out 2014 in September through December. On Wednesday, September 10, at MIT Lincoln Laboratory in Lexington, MA, Kevin Foy presented, "Maintaining Quality & Reliability of a Complex Product through a Global Manufacturing Transfer," which detailed the quality and reliability aspects of moving leak detector builds from Lexington, Massachusetts to Malaysia. On Wednesday, October 8, 2014, at Analog Devices in Wilmington, Andrew Olney's proxy presented "Eliminating the Top Causes of Customer-Attributable Integrated Circuit Failures," a meeting conducted jointly with the IEEE Solid State Circuits Boston Chapter. On Wednesday, November 12, 2014, we met jointly with the Northeast Chapter of the ESD Association to learn from Andrew Kopanski of MIT Lincoln Laboratory speaking on the challenges of "ESD Control in a Laboratory Environment." Finishing out the year, as part of our past Chairs Dinner, we were fortunate to have guest speaker Eli Brookner, an IEEE AESS Distinguished Lecturer, spoke on "Reliability as Impacted by Phased-Array and Radar Breakthroughs." The December 2014 year-end event doubled as the Chapter's Annual Past Chairs Dinner in conjunction with the usual monthly meeting. The past chairs dinner recognizes on a yearly basis the erstwhile chairs of the IEEE Boston Reliability Chapter for their years of dedication and contributions to the chapter's ongoing vitality and success. This meeting began, as typical, with informal social networking, followed by dinner & announcements, then the presentation by the keynote speaker, this year being the aforementioned Dr. Brookner.

The New Year started out with an excellent joint meeting at MIT Lincoln Laboratory with The Northeast Chapter of the ESD Association and Ted Dangelmayer's presentation entitled "Class 0 and Reliability ESD Case Studies," featuring one case study highlighting the ever-increasing ESD challenges involving 22% failure rates despite having a good S20.20 program in place. After having survived late January's "Snowpocalypse 2015," we are looking forward to Tuesday February 10<sup>th</sup>'s talk by MIT Microsystems Technology Laboratories Director Jesús A. del Alamo entitled "Recent Progress in Understanding the Electrical Reliability of GaN High-Electron Mobility Transistors," followed by a Wednesday March 11<sup>th</sup> meeting featuring a presentation by our most recent former chair (2012-2014), Dr. Daniel Weidman, on addressing top-level system reliability via proper compilation of sub-system considerations. Both meetings will be held at MIT Lincoln Laboratory.

If you are interested in presenting almost any technical topic, related to hardware or software, if it is related to reliability, please contact us for our Fall 2015 schedule, and/or suggest a topic on website sub-link "Suggest a Meeting Topic" <http://ewh.ieee.org/r1/boston/rl/suggestform.html>. If you are local to the Boston area, or if you are in the Boston area the second Wednesday of the month, please attend our meeting, enjoy the networking camaraderie, and introduce yourself to me. I hope to see you soon.

Regards,

Charles H. Recchia, Ph.D.

Chair, IEEE Boston Reliability Chapter, joint with Providence, RI and New Hampshire

## **Contents of this issue**

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### **Recent Activities:**

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|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| December 12, 2014 | "Reliability As Impacted by Phased-Array and Radar Breakthroughs" by Eli Brookner at MIT Lincoln Laboratory, Lexington, MA. Dr. Brookner is an internationally known radar expert, author of four books and IEEE distinguished Lecturer. |
| January 14, 2015  | Ted Dangelmayer, Dangelmayer Associates, LLC, "Class 0 and Reliability ESD Case Studies," at MIT Lincoln Laboratory, Lexington, MA.                                                                                                      |
| February 16, 2015 | Jesús A. del Alamo, "Recent Progress in understanding the Electrical Reliability of GaN High-Electron Mobility Transistors," at MIT Lincoln Laboratory, Lexington, MA.                                                                   |

### **Upcoming Events:**

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

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|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| March 11, 2015 | Dr. Daniel Weidman of MIT Lincoln laboratory on "System Impact of Reliability". Meeting will be held at MIT Lincoln Laboratory, Lexington, MA.                                  |
| April 8 , 2015 | Dan McCarthy, VP of Operations at Solidscape hosting "Plant Tour and Meeting Presentation of Solidscape Inc". Meeting will be held at 316 Daniel Webster Highway, Merrimack, NH |
| May 13 , 2015  | "Recent advances in Scanning Electron Microscopy" by Vern Robertson from JEOL USA Inc. Peabody, MA. Meeting will be held at MIT Lincoln laboratory, Lexington, MA.              |

## Recent Chapter Activities

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### **"Reliability As Impacted by Phased-Array and Radar Breakthroughs."**

On Wednesday, December 10, 2014, Dr. Eli Brookner presented "Reliability As Impacted by Phased-Array and Radar Breakthroughs" at MIT Lincoln Laboratory in Lexington, Massachusetts. He provided some historical background, about some acoustic systems that predated radar systems. Then he described radar systems based on high-power vacuum tubes, and then on high-power solid-state devices, and then on integrated circuits, with particular emphasis on phased-array radar systems. Dr. Brookner said that the MTBF (Mean Time Between Failures), which is a standard measure of reliability, of high-power vacuum tubes is only 26,000 while the MTBF of solid-state systems is 200,000 hours, which is almost ten times as long. He then went on to describe many different radar systems for military applications, mostly at S-band and X-band. He said that for the US air-traffic control system, \$4 billion is being invested to use phased-array radar, which eliminates rotating antennas, and, when moving parts are eliminated, maintenance costs decrease and reliability improves. And, about 80 air-traffic control systems across the US will have their klystrons removed and replaced with solid-state systems. He mentioned a couple of manufacturers, including Marcel Gadreau of Diversified Technologies, who was present at the meeting, and Thales, the large manufacturer in France who manufactured a phased-array system for the Netherlands. Also, he showed pictures of his travels. For the second part of his talk, he spoke about metamaterials, which can have properties not found in materials in nature, such as a negative index of refraction, which enables the diffraction limit, which is about  $1/2$ , to a factor of six better:  $1/12$ . He said that there is a company called Kymeta that is planning a laptop-sized phased array, which was demonstrated at the end of 2013, with commercial development expected by the beginning of 2016. O3b and Kymeta plan a joint-venture satellite system. He predicted that the future of phased arrays may include consumer electronics, and, towards the end of his presentation, he gave a few such examples. In microwave ovens, he said that the 3 GHz, S-band magnetron will be replaced in ovens with a high-power transistor of about 250 W. He said that more than one million, 7-beam, phased-arrays designed by Raytheon for automotive collision avoidance have been built by Valeo for only hundreds of dollars each for installation in luxury vehicles. He said that a radar gun to measure the speed of a baseball costs only about \$80, and that a radar gun to measure the speed of vehicles, like a police radar gun, is only about \$20.

Dr. Brookner is a world-recognized expert on radar, he has authored a few books, and he is an IEEE Distinguished Lecturer. This meeting, as with every December meeting of the IEEE Boston Reliability Chapter, was our opportunity to honor our past Chairs, and to announce the election results for the chapter officers for the next calendar year. On a more personal note, the December IEEE Boston Reliability meeting was very successful, with 73 people attending at MIT Lincoln Lab. (48 people are IEEE members.) After the meeting there were some nice emails. Our Chapter Secretary, Aaron DerMarderosian wrote "This was one of the best meetings in a long time! The food & attendance was outstanding, everyone seemed to enjoy Dan & Eli's presentations, could have not asked for better at a past chair's dinner meeting!" Our guest speaker, IEEE Distinguished lecturer Eli Brookner wrote, "Thanks for the invitation to give the Annual Reliability Talk. It was great. First class. A blast. You guys do a fantastic job. I believe you fellows run the best local chapter as well as being the best Reliability Chapter in the world." Thanks to everyone who supports these monthly events in various ways, at MIT Lincoln Lab and other organizations.

<http://ewh.ieee.org/r1/boston/rl/presentations.html>

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## "Class 0 and Reliability ESD Case Studies."

On Wednesday, January 14, 2015, Ted Dangelmayer presented, "Class 0 and Reliability ESD Case Studies." Ted wrote the book, "ESD Program Management: A Realistic Approach to Continuous Measurable Improvement in Static Control," established a state-of-the-art program at Lucent Technologies in North Andover, Massachusetts, and that was the first site in the USA to become S20.20 certified.



**Presentation by Ted Dangelmayer on Jan 14, 2015**

This presentation was held at MIT Lincoln Laboratory in Lexington, Massachusetts and included interesting information about ESD (Electrostatic Discharge) and several case studies. Many electronic components are ESD "Class 0", which may be defined as having a sensitivity of <250 V HBM (Human-Body Model) or CDM (Charged-Device Model), whichever is lower. Ted pointed out that ESD damage can be cumulative, with device failure resulting from multiple sub-threshold exposures to ESD. Ted said that optoelectronics technology, including solid-state lasers, LEDs (even the old "jelly-bean" LEDs), and detectors (such as PIN diodes and APDs), is more prone to latent ESD failures than ICs, MEMS, or even MR heads, because the technology degrades. Some, such as blue LEDs, are even ESD Class 0. Ted went on to describe the trends of device thresholds. From 1975 to 1992, devices were designed to be more and more robust. Since about 1992, however, device thresholds have declined, due to demands for smaller, lighter-weight devices. In 2014, most devices have reached the threshold of ESD Class 0 sensitivity. [In fact, at MIT



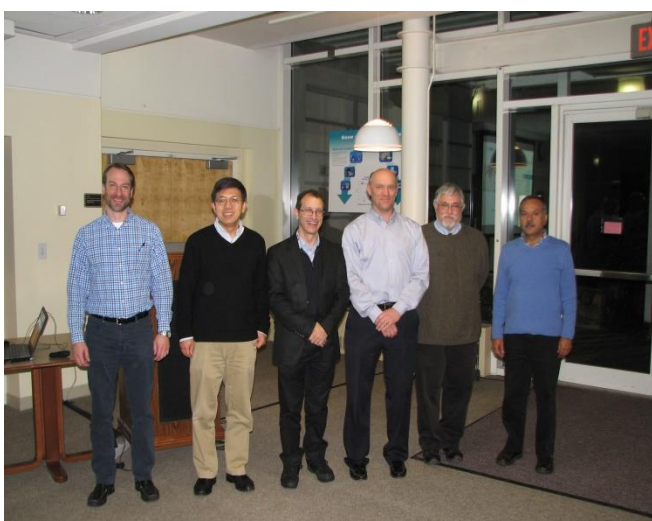
Lincoln Laboratory, for example, about a year or two ago, at our incoming electronics inspection, we started using ESD Class 0 protocols always, as the default, rather than only when components are labeled as such.] Ted demonstrated a small ESD "event detector," which has a response centered at about 1 GHz, which is equivalent to a 33 cm circumference loop antenna into a 1 GHz or 500 MHz oscilloscope. Ted fielded several questions during his presentation. In response to one question, he said that a corona discharge is lower energy and slower than a typical electrostatic discharge. Ted said that the largest number of failures are categorized as "No Trouble Found," and the second largest number is "Electrical Overstress (EOS)." ESD is often misdiagnosed as EOS. Ted then went on to describe several case studies. In one of the case studies that Ted presented, a chassis in a manufacturing facility was on an ESD tray, which was too conductive, but the main problem was that the tray was riding on a conveyor with plastic rollers. Plastic rollers are acoustically quieter and mechanically softer than metal rollers, but they electrically insulate. A quick and inexpensive fix to the conveyor system was to install small metal springs at intervals along the length of the conveyor to discharge the tray periodically. In another case study, a diamond-tip wafer saw create discharges, even with water present. The solutions were to reduce the resistivity of the water from 17 MOhm-cm to about 0.5 MOhm-cm, and to change the saw material, and to change the saw speed. Then Ted told us his story where the phone of one of the Vice Presidents of AT&T powered down, but only when very important people called, including his boss and his wife. All phone sets were replaced, the wiring was replaced, and the line was routed to a different central office, all to no avail. The secretary, however, had taken Ted's required ESD awareness training, and insisted that they call Ted. Ted found that the secretary had a ring that discharged to the cord where it entered the handset, but only when she stood up to get her boss's attention. Once diagnosed, solving the problem was straightforward. For another case study, Ted showed a video of an electronics rack that was so sensitive that shaking coins in one's pocket nearby, or shaking two batteries in a plastic bag, was enough to affect the equipment; this resulted in one billion dollars of equipment in New York City being replaced by AT&T. Near the end of his presentation, Ted said that the S20.20 standard addresses only HBM (Human-Body Model) but does not adequately address CDM (Charged-Device Model), CBEs (Charged-Board Events), or Charged-Cable Events. Ted Dangelmayer, as always, gave a very interesting, interactive, and informative presentation. This was a joint presentation between the IEEE Boston Reliability Chapter and the Northeast Chapter of the ESD Association. <http://ewh.ieee.org/r1/boston/rl/presentations.html>

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### **Reliability Chapter's Past Chairs Dinner Meeting (December 2014) Pictures**



**IEEE Boston Reliability Chapter Officers and AdCom members**



**Reliability Chapter's Past chairs and Attendees**

## **Upcoming Events**

Reliability Chapter meeting on March 11, 2015 at 6:00 PM at MIT Lincoln Labs, MA.

### **"System Impact of Reliability" by Daniel J. Weidman, Ph.D.**

Dr. Weidman is a Mission Assurance Engineer at MIT Lincoln Laboratory working on reliability engineering testing and analysis for the Laboratory's most complex space projects. He supports all aspects of mission assurance, including safety, reliability, systems engineering, quality, and project management, throughout the life cycle of each project. Dan is also the immediate past chair of IEEE Boston reliability chapter.

As always chapter meeting is open for IEEE members and non-members at MIT Lincoln Laboratory in Lexington, MA. For meeting registration visit chapter website: <http://www.ieee.org/bostonrel> Registration is required so that we can plan the pizza and beverages, but there is no charge to attend.

## **Announcements**

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**I. Chapter Annual AdCom election results-** IEEE Boston Reliability Chapter, Joint with New Hampshire & Providence

### **2015 Elected Chapter Officers and AdCom members**

Chair- Charles Recchia

ExCom and Past Chair – Ramon De La Cruz

Vice-Chair- Jay Yakura

Website – Jeff Clark

Secretary- Aaron DerMarderosian, Jr.

Newsletter, Social Media Editor- Neeta Agarwal

Treasurer- Don Markuson

Publicity – Nihar Senapati

Immediate Past Chair- Dan Weidman

Membership – Alik Apelian

If you are an IEEE & Reliability society member in the IEEE Boston, New Hampshire, or Providence section and interested in volunteering with chapter activities find details by contacting any person listed above or at <http://ewh.ieee.org/r1/boston/rl/vote15.html>.

### **III. Annual Reliability Chapter Awards for 2014**

The annual Reliability Chapter awards were announced. The IEEE Boston chapter was awarded the “third best” IEEE reliability Chapter in the world. The award selection criteria are based on membership, meeting attendances, number of meetings, workshops or conferences, training sessions, written papers, technical tours and other pertinent activities.

### **IV. IEEE Membership Elevation Information:**

The IEEE Boston Section recently held a Membership Elevation Clinic at MIT Lincoln Lab. This was a way to help people through the process of being elevated from IEEE Member to IEEE Senior Member. Various information is needed for this process, such as a resume. Further it helps if there is an "executive summary" of one or two paragraphs showing progression in one's career, such as promotion to a team leadership position or authoring publications or patenting inventions. Certain career accomplishments are required, such as a minimum number of years of experience since one's degree, with fewer years of experience needed for higher degrees. To qualify to become a Senior Member, you need 10+ year of experience. The IEEE, for these purposes, counts a Ph.D. as the equivalent of 5 years of experience, while an MS is the equivalent of 4 years of experience. Most (almost all!) people take more than one year to get a Ph.D. Therefore, many recently graduated Ph.D.'s qualify to become Senior Member because the MS was more than 6 years ago even though the Ph.D. was less than 5 years ago! In practice, most people who are considering elevation to Senior Member are probably qualified for such a membership elevation. Recommendations from IEEE Senior members are required. We suggest interested people should get in touch with Senior Members from the IEEE Reliability Chapter as well as other Boston IEEE Chapters who are willing to write recommendations. If you are an IEEE Member and are interested in becoming a Senior Member, please contact Ramon de la Cruz at [rdelacru@ieee.org](mailto:rdelacru@ieee.org)

## **Chapter Participation and Outreach Efforts**

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### **I. Leadership and membership development workshop**

Many reliability chapter officers attended officer's workshop coordinated by Paul Zorfass of IEEE Boston

main section on Jan 22, 2015 6pm at MIT Lincoln Lab Cafeteria. It was an interesting workshop and fun to meet officers from IEEE Boston's other societies in north east region.

## II. 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 need a good team of volunteers that help us keep things going. If you would like to join us, there is probably a good 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>.

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*Readers can contact chapter newsletter editor Dr. Neeta Agarwal ([neetaagar93@gmail.com](mailto:neetaagar93@gmail.com)) if they have any comment/suggestion or are interested in contributing to next issue. Thanks.*

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### **The IEEE Reliability Society Joint Section Chapter Boston - New Hampshire - Providence Newsletter available at the following link:**

[Boston - New Hampshire - Providence Joint Chapter Newsletter](http://ewh.ieee.org/r1/boston/rl/newsletters.html)

or copy and paste the URL below on your browser  
<http://ewh.ieee.org/r1/boston/rl/newsletters.html>