



November 2013 Newsletter

Joint Section Chapter – Boston - New Hampshire - Providence

September 2013 – November 2013

<http://www.ieee.org/bostonrel>

Greetings,

We have had a great start to the academic year with our September, October, and November meetings.

On Wednesday, September 11, 2013, Prof. Martin Bazant of MIT talk spoke about the reliability of lithium-ion batteries. Given the importance of batteries for clean, efficient energy, this was a timely topic. Prof. Bazant holds joint positions with the Department of Mathematics and the Department of Chemical Engineering at MIT, and gave a very clear and interesting presentation with a uniquely quantitative perspective based on his modeling. Coincidentally, his talk was on September 11, 2013, and his father, Prof. Z. P. Bazant of Northwestern University, provided an expert analysis of the collapse of the World Trade Center on September 11, 2001 within a few days of that event.



On Wednesday, October 16, 2013, Dr. James W. Wade talked about Mission Assurance. Dr. Wade is the senior Vice President of Mission Assurance for Raytheon's global operations. Raytheon has 72,000 employees. Personally, it was nice to see Dr. Wade again, because he was the Head of the Mission

Assurance Office when I first started working at MIT Lincoln Laboratory in the Mission Assurance Office.

On Wednesday, November 13, 2013, Ted Dangelmayer spoke to us about protocols for handling electronics that are sensitive to electrostatic discharge, with an emphasis on ESD Class 0 protocols. In the previous newsletter (August 2013), I detailed why understanding ESD is so important to anyone concerned with the reliability of electronics. Ted consults around the world on this topic, so we were pleased to have him present to us, free of charge.

For more information on the talks mentioned above, please see the pages of this newsletter that follow.

On Wednesday, December 11, 2013 we will have Dr. Vanu Bose speak to our group about "Survivability for Public Safety Networks". Dr. Bose is the founder and CEO Vanu Inc., which is dedicated to technical innovation to enable cellular coverage in areas that cannot be covered properly with existing technology. We are pleased that he has taken the effort to plan a talk for our group that is focused on survivability and reliability, including an intriguing examination of the assumption that higher availability is an appropriate metric for a public safety network. This meeting will be our annual December meeting when we honor the past Chairs of the Boston Reliability Chapter. Please register now for this event at our web site.

This year, for the first time in a few years, we will have a meeting in January. On Wednesday, January 15, 2014, we will have a presentation by Ethan Cascio, who is the Radiation Effects Test Program Manager at The Francis H. Burr Proton Therapy Center at Massachusetts General Hospital, on "Those Upsetting Ions - The Effects of Radiation on Electronics." This topic is relevant to anyone interested in how electronic components are tested for deployment in a radiation environment, such as for space applications.

We have started to schedule people to speak to our group in February, March, April, and May, so check our web site when we get closer to those dates. This time, for the first time in a few years, we may even have a presentation in June 2014.

If you are interested in presenting, or have a suggestion for someone to present to our group, let us know. And, if you are interested in helping out in any way, big or small, contact us. You can attend one of our AdCom (advisory committee) meetings to find out more about the many diverse tasks that we do. We are all volunteers, so any help would be appreciated.

When you attend our next meeting, please introduce yourself to me.

Best regards,

Dr. Dan Weidman

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

Contents of this issue

Recent Activities

- September 11th, 2013 Prof. Martin Z. Bazant of MIT's Dept of Mathematics and Dept of Chemical Engineering discussed degradation mechanisms in Li-ion batteries and simple theories of capacity fade and lifetime statistics in single cells and battery packs, compared with experimental data.
- October 16th, 2013 "Perspectives on Mission Assurance and Reliability" by Dr. James Wade, Vice President of Mission Assurance, Raytheon, at MIT Lincoln Lab, Lexington, MA.
- November 13th, 2013 This event was organized jointly with NE-ESD and SMTA Boston Chapters and was held at MIT Lincoln labs, Lexington, MA. Ted Dangelmayer of Danglemayer Associates, LLC presented a highly interactive talk on "ESD Class 0-The Risk and how to Avoid Quality and Reliability failures".

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

- December 11th, 2013 Annual Past Chairs dinner and monthly meeting. The past dinner recognizes past chairs of the IEEE Boston Reliability chapter for their years of contribution to the chapter activities. Dr. Vanu G. Bose will present network designs for public safety.
- January 15th, 2013 Presentation by Ethan Cascio of Burr Proton Therapy center, MGH, Boston, MA. His talk will cover terrestrial, space, and manmade radiation environments, as well as basic radiation concepts. The history of the awareness of the effect of radiation on electronics will be covered as well.

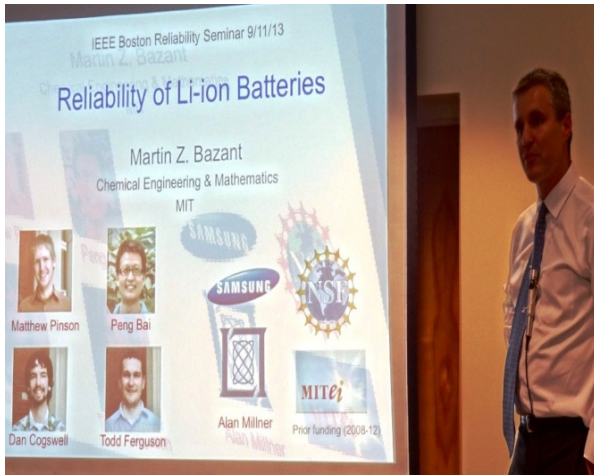
Announcements Details on other chapter and community related updates.

Recent Chapter Activities

"Lithium-Ion Battery Degradation: Comparative analysis of theories with experimental data"

On Wednesday, September 11, 2013, Prof. Martin Bazant of MIT spoke on "Reliability of Lithium-Ion Batteries." Prof. Bazant is a Professor of Mathematics and a Professor of Chemical Engineering at MIT

in Cambridge, Massachusetts. (Coincidentally, Prof. Bazant's father, Prof. Z. P. Bazant of Northwestern University, provided one of the first descriptions of the engineering details of the causes of the collapse of the World Trade Center towers in New York City on September 11, 2001. We spoke about this briefly before the formal portion of Prof. Martin Bazant's presentation, since it was the anniversary of this tragic event.) Prof. Martin Bazant's presentation was presented clearly and at a level accessible to those of us who are not experts in battery reliability. Prof. Bazant has introduced some simple models that correlate well with measurements in a field that has been dominated by empiricism and has had very little analytic modeling to explain measured data. Prof. Bazant mentioned a succinct comparison between a Weibull Distribution and a Gaussian (normal) Distribution: a Weibull Distribution is like a chain, which breaks if one link breaks, while a Gaussian distribution is like a bundle of fibers holding an elevator, which falls only if all fibers break. Prof. Bazant suggested (contrary to my assumption) that exploding batteries are not the tail end of a normal distribution, but rather a result of an unusual external event or circumstance; by analogy, stock price modeling is a random walk and then there are occasional jumps or spikes when there is a major political event. Those are just a few snippets of information from the presentation. To see the slides from the presentation and to enjoy the main points, please visit our web site: <http://ewh.ieee.org/r1/boston/rl/presentations.html>



(Sept meeting pictures courtesy of Kedem Giora & Ramon de la Cruz, Chapter AdCom members)

"Perspectives on Mission Assurance and Reliability" by Dr. James Wade VP of Mission Assurance, Raytheon at MIT Lincoln Laboratory on Oct 16st, 2013.

On Wednesday, October 16, 2013, Dr. James W. Wade, Vice President for Mission Assurance of Raytheon spoke to our group on "Perspectives on Mission Assurance and Reliability." Dr. Wade is in charge of Mission Assurance globally for Raytheon, which has 72,000 employees. He provided us with an overview of Mission Assurance with various interesting insights. For example, he suggested that building a widget correctly is quality, while building the right widget is Mission Assurance. (This is consistent with the idea of a Mission Assurance group having sufficient engineering expertise to provide some helpful knowledge related to the design and applicability of various components and subsystems in addition to generic experience in various quality processes.) Dr. Wade talked about shortening procedures and checklists by bringing together the key people to determine the key parameters of a process, such as assembling a system. As an example, he showed a picture of a satellite that was being assembled in a facility and it had accidentally fallen over, because bolts to keep it in place had not been installed. He said, however, that twelve people had signed off that the bolts had been installed. He explained that this is an example of where fewer signatures, perhaps just one or two, would be better, because many people simply sign when they see the previous person has signed. That is, when one person made a mistake by signing, none of the subsequent signatures caught the mistake. His theme was that Mission Assurance can examine processes and improve them, which means some additional documentation in some organizations, but can mean reduced documentation in other organizations.



(October meeting pictures courtesy of Aaron Dermarderosian, Chapter Secretary)

Dr. Wade gave the audience an insight on how mission assurance is a culture and application processes that assures that successful solutions are delivered to meet customer's needs. This requires the alignment of goals together with a collective commitment that spans organizational boundaries in order to achieve success. He further emphasized that Raytheon's Mission Assurance is a system wherein each successive capability level builds upon a solid foundation of leadership and policy and then constructed with subsequent supporting levels that include quality, product integrity (reliability, system safety, verification, etc) and program execution. Mission Assurance is considered a personal and collective commitment to deliver, for the duration of their life cycles, products and services that contribute to customers' mission success.

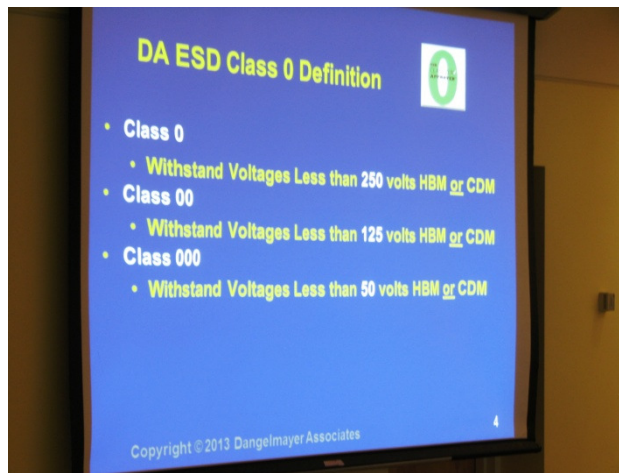
Dr. Wade has more than twenty-five years of Mission Assurance experience with the U.S. government, and industry (Raytheon) and was previously in charge of Safety and Mission Assurance at MIT Lincoln Lab and before that, the head of Safety and Mission Assurance for NASA, in Houston.

“ESD Class 0 - Who's at Risk and How to Avoid the Quality and Reliability Failures?” by Ted Dangelmayer - Dangelmayer Associates, LLC

This event was held on Wednesday, November 13th at MIT Lincoln Laboratory, Lexington, MA and was a joint event with NE-ESD (Northeast chapter of the Electrostatic Discharge Association), and SMTA (Surface Mount Technology Association), Boston chapters.

Ted gave a great presentation. He started off with a few brief case studies. One was a medical company that was having failures while the device was being used by the customer, and Ted's team was able to solve the problem in less than two weeks. When Ted worked at Lucent (AT&T), he started their ESD program. AT&T emphasized quality. Ted said that managing and administering a program is as important as specifying the technical requirements. He wrote a book on ESD program management.

EOS (Electrical Overstress) is the overarching term for all sorts of other phenomena, such as Human Body Model, Charged Device Model, and Charged Board Event. While most companies are acutely aware of the hazards of ESD (electrostatic discharge), few are aware of how to handle the extreme sensitivities of ESD Class 0 devices or if they are at risk of quality or reliability failures. Others are unaware of device trends towards these ultra-sensitive components and the resulting reductions in IC device design target levels.





(November meeting pictures courtesy of Aaron Dermarderosian, Chapter Secretary)

Ted and the Northeast Chapter of the ESD Association have proposed that ESD Class 0 is HBM or CDM sensitivity below 250V, "Class 00" is HBM OR CDM below 125V, and "Class 000" is HBM or CDM <50V. Average device thresholds have been dropping year after year, and will likely drop below 250V in 2014. This means that the average part will be ESD Class 0 sensitive. A good HBM ESD mitigation program as described by S20.20 is an essential starting point. Almost all (>99.9%) of ESD failures are now CDM not HBM.

Myth: Circuit boards are less sensitive to ESD than devices. In fact, boards are more sensitive than components, due to larger capacitance, and can experience up to 25 amps of discharge current. Nokia goes so far as to assert that all ESD failures happen at the board level.

No industry standards include CDM for ESD Class 0. Therefore, when asked, Ted suggested that requirements be given to a contract manufacturer as S20.20 plus an addendum.

Higher surface resistance of work surfaces and tabletops can reduce discharge current. Also, Corona discharge is harmless even to the most sensitive devices. This came up in a video that Ted showed where an arc was repeatedly drawn to the metal "handles" of tweezers, but then just a corona discharge to the dissipative tips of the tweezers.

Ted also showed an interesting video along with telling the story of a manufacturing facility where his ESD event detector had so many responses that he had to wait until the next day when, fortuitously, there was no one working. They brought in one technician and then, step by step, eliminated one ESD problem after another, such as hard grounding a piece of equipment with a wire instead of with a drag chain.

Upcoming Events

“Survivability for Public Safety Networks” by Dr. Vanu G. Bose- President and CEO, Vanu Inc.

The reliability requirements for public safety networks are different from commercial networks. Conventional thought is that public safety networks need to have higher availability than commercial network because they must operate in disaster situations, if commercial networks are built to a 5-

nines availability standard, then public safety networks must meet a more stringent standard. However, this talk argues that the commercial reliability metrics are not appropriate for public safety networks and increasing the "number of nines" will not improve network availability in disaster scenarios. This talk presents network design principles for public safety.

This event is the 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. Traditionally, this meeting starts with social networking, followed by dinner and announcements, followed by the presentation. Registration opened in mid November.

Location:

Building: Main Cafeteria
MIT Lincoln Laboratory
244 Wood Street
Lexington, Massachusetts

Date: 11-Dec-2013 Time: 05:30PM to 08:00PM

Registration: On-line at the IEEE Reliability joint section chapter website, <http://www.ieee.org/bostonrel>

Announcements

Reliability Chapter's Facebook Presence

The chapter recently established presence on Facebook so check it out. The latest meeting announcements are posted on wall. Visit the page at <https://www.facebook.com/pages/IEEE-Boston-Reliability/231112043598940>, or search Facebook for "Boston Reliability". Click "Like" and befriend us. Your feedback is most welcome.

Annual Reliability Chapter Awards for 2013

The annual Reliability Chapter awards were presented on June 22nd, 2013 in Gaithersburg, Maryland. The IEEE Boston chapter was awarded the second 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. Dr. Weidman, Chapter Chair, attended the award ceremony and accepted the honor on behalf of chapter.

Community Outreach Actions



This summer, our chapter made a donation to Boston's One Fund, to help the victims of the tragedy at the Boston Marathon, on April 15, 2013.



We are sad to announce the passing of Venkateswara Rao Dhullipalla, who was known as "Rao" by most of us. He may have had the best attendance at our meetings. He often came very early to our monthly meetings and would help us set up. He will be missed by all of us who knew him. Our chapter made a donation in his memory to the American Cancer Society. He passed away on June 20, 2013. <http://www.obitsforlife.com/obituary/729904/Dhullipalla-Venkateswara.php>



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.

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

[Boston - New Hampshire - Providence Joint Chapter Newsletter](http://ewh.ieee.org/r1/boston/rl/newsletters/boston_chapter_newsletter_nov13.pdf)

or copy and paste the URL below on your browser

http://ewh.ieee.org/r1/boston/rl/newsletters/boston_chapter_newsletter_nov13.pdf