



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

Greetings,

The IEEE Reliability Joint Section Chapter (Boston - New Hampshire - Providence) has held a few meetings summarized on the following pages since our last newsletter. Note that in years past, our chapter has placed among the best IEEE Reliability Chapter in the world, and we are gearing up to submit our metrics for this past year to vie once again for top spot. Examples of factors evaluated include such activities as technical publications, meeting attendance, and participation in conferences. As a member of our chapter, you can help us stand out by providing your pertinent 2014 chapter member activities (deadline May 15th) in the "Help Us Win an Award" link on the chapter website.

We would also invite you to consider the many opportunities for volunteering; you can offer up as much or as little time as you would like. We could use your support in organizing events, taking notes, snapping photographs or any number of other contributory tasks. Please contact me or anyone else on the IEEE Boston Reliability AdCom (Advisory Committee).

We hope you have been able to take advantage of the lectures and networking opportunities offered by our local chapter, and that we see you at the next chapter event on May 13, 2015 before we begin our collective summer respite which ends with our September meeting. Please watch your inbox, the IEEE Reflector, and/or our chapter website for details on this and our other upcoming meetings. In closing, a quick reminder that the 2015 ASTR* (Accelerated Stress Testing and Reliability) Conference, which is hosted jointly by ASQ Reliability Division and the IEEE Reliability Society, will be held right here in Boston/Cambridge September 9-11. Please visit www.ieee-astr.org for registration, call for papers, and additional information.

Looking forward to seeing you.

Regards,
Charles H. Recchia, Ph.D.
Chair, IEEE Boston Reliability Chapter, joint with Providence, RI and New Hampshire

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| March 11, 2015 | Dr. Daniel Weidman of MIT Lincoln laboratory on "System Impact of Reliability". Meeting was 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 was held at 316 Daniel Webster Highway, Merrimack, NH. |

Upcoming Events:

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

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| May 13, 2015 | "Recent advances in Scanning Electron Microscopy" by Vern Robertson from JEOL USA Inc. Peabody, MA. Meeting, at MIT Lincoln laboratory, Lexington, MA. |
| Sept 9, 2015 | "STAMP process" by Dr. John Thomas, MIT Campus, Possibly joint with ASTR 2015, conference in Cambridge, MA. |
| September 23, 2015 | Ted Dangelmayr on LENR (low energy Nuclear Reactions also known as Cold fusion) at MIT Lincoln Labs, 3 Forbes Rd, Lexington, MA |
| October 14, 2015 | Mr. James McLeish from DfR Solutions at MIT LL, 3 Forbes Rd, Lexington, MA |

Recent Chapter Activities

"Recent Progress in Understanding the Electrical Reliability of GaN High-Electron Mobility Transistors."

On Tuesday, February 17, 2015, at MIT Lincoln Laboratory in Lexington, MA, Prof. Jesus del Alamo spoke to our group. He is the Director of the Microsystems Technology Laboratory at MIT in Cambridge, MA. His presentation was, "Recent Progress in Understanding the Electrical Reliability of GaN High-Electron Mobility Transistors." Prof. del Alamo said that GaN can handle about ten times the power of GaAs. He described experiments with the drain-gate voltage increased, incrementally, to study the formation of damage at the drain-gate interface. Damage viewed in SEM (Scanning Electron Microscope) pictures correlates with degradation in electrical performance. This damage was also studied as a function of temperature. Studies were done dc, as described above, and with RF (radio frequency) voltage. He described an inverse piezoelectric effect and referenced several experiments that support this model. The damage sites appear as "pits," which seem to be electrically conductive, and the sites of increased mechanical stress. The formation of these pits is enhanced by the presence of water vapor; the transmission rate of water vapor into the material corresponds well with the rate of water vapor that has been found to be needed to form these pits. Dr. del Alamo presented a great deal of information clearly and concisely.



"System impact of Reliability."

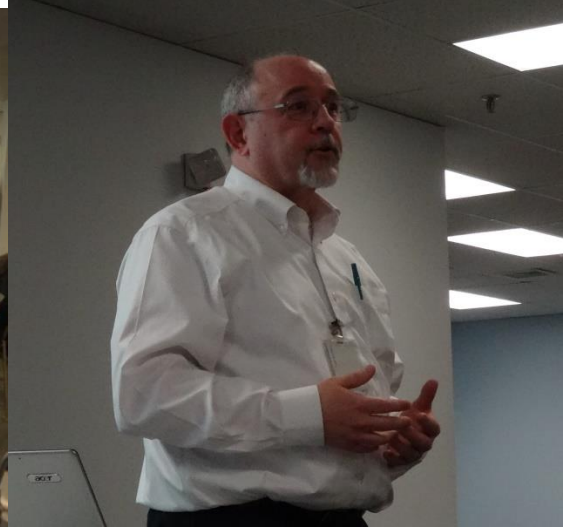
On Wednesday, March 11th, 2015, Dr. Daniel Weidman gave a presentation to our chapter. Dr. Weidman, Technical Staff with Mission Assurance at MIT Lincoln Laboratory since 2009, spoke on "System Impact of Reliability". In his talk, building on the context of ever more stringent requirements on size, weight, and power for satellites with schedule, budget, and commercial-off-the-shelf (COTS) pressures, he discussed the flow down of reliability requirements from system-level to allocation of reliability targets for each subsystem, providing an example including Electronics, Power Supply, Detector and Chassis subsystems including estimations for each per MIL-HDBK-217F. A component reliability Pareto was presented wherein FIT (Failure in Time) rate per hour is plotted by part description, featuring integrated circuits including FPGA and capacitors in large quantities. A spreadsheet approach to handling the MIL-HDBK-217F analyses incorporated the various MIL-217 factors for temperature, voltage stress, quality, and environmental aspects for each component, with reliability testing data included where vendor data was unavailable. Proactive methods of Failure Modes and Effects Analysis (FMEA) and Single Failure Point (SFP) were then discussed in accordance with MIL-STD-1629A and redundancy-based solutions were discussed relative to high likelihood and high consequence failure mode items. Reactive analyses in the form of Ishikawa Diagrams and branched "Why?" fault-tree analyses were also covered, with the important point made that Fault-Tree Analysis can also be employed proactively during the design phase. Best practices for reliability were then discussed with respect to design and fabrication, inspections, and component level checks for prohibited materials and counterfeit parts elimination among other things. The concepts of qualification by similarity and heritage were presented as covered in NASA EEE-INST-002.



Dr. Weidman's presentation received multiple questions from the audience in attendance both during and afterwards, with interest-levels piqued by numerous examples, including for instance, mention of the successful MRO, GeoEye-1 and Worldview-2 missions. Dr. Weidman's enthusiastic contribution as primary technical presenter was a great follow up to his three-year tenure as chapter Chair from 2012 through 2014.

"Joint Dinner Meeting and factory Tour"

On Wednesday, April 8, 2015, our IEEE Boston Reliability Chapter hosted the monthly meeting at Solidscape in Merrimack, New Hampshire. Solidscape manufactures 3D printers for jewelry manufacturers, and provided our Chapter with presentations and a tour. Solidscape is owned by Stratasys, which also owns MakerBot. Stratasys has the largest installed customer base of 3D printers in the world.



The meeting evening started with networking over pizza and beverages. Dan McCarthy, Vice President of Operations for Solidscape, gave us an introduction. Solidscape was founded in 1994 by Royden C. Sanders, Jr. (of "Sanders Associates") to 3D print parts, to avoid delays from machine shops. 3D printing has been around for 30 years. Solidscape sells hardware, software, and materials. Then there were a couple of presentations by others, each of which was a case study of a hardware failure and its resolution.

After the presentations, we were split into a few groups for tours. When we went down to the factory floor, Dan explained that the Solidscape 3D printers place 5,000 drops of wax per inch, by piezo, and,

therefore, there are billions of cycles in the life of a machine. After each layer is deposited, a cutter moves across the layer to plane the top surface smooth; this feature is unique among 3D printers and greatly contributes to Solidscape's high-precision smooth surface finish. The "wax" is proprietary, and formulated in two colors representing the "Build" and "Support" materials. The colors are formulated so that, after 3D printing, the red sacrificial support material is dissolved away, leaving the blue Build wax model that is then used in the standard "lost-wax" casting process for jewelry, small sculptures, or high-precision small parts for manufacturing. In the lost-wax casting process, a flask of investment material (often similar to Plaster-of-Paris) forms a mold around the wax model, and then the desired metal, such as gold or silver, is poured into the mold, taking the place of the wax. An object, or a set of objects, can be made as large as the 6 inch by 6 inch by 4 inch "build envelope" of the Solidscape 3D printer. The 3D printing has several advantages over the traditional lost-wax process. Several pieces of jewelry can be 3D printed at once. Identical pieces of jewelry can also be 3D printed and then cast in a Direct Manufacturing workflow. Once designed, there is minimal labor to print the wax model. Solidscape 3D printer has material capacity to run for 72 hours unattended. And, as with any 3D printer, geometries can be generated that cannot be generated by any other method; this is particularly important for some wonderful jewelry designs or highly complex industrial parts such as high-precision turbines and impellers with internal curved micro cooling channels.

From the perspective of production efficiency, it was impressive that Solidscape uses Microsoft PowerPoint for their work instructions at each station. This approach is low cost and very effective. They used a digital camera to take pictures for the work instructions. This author's experience with writing work instructions in Microsoft Word, for example, encourages a lot of text, whereas using PowerPoint encourages the use of more pictures. The Solidscape factory floor embraces lean manufacturing principles, with kan-ban systems for the control of inventory and the flow of printers from one station to the next. Therefore, it is visually obvious when inventory is running low and when a station is ready to accept the next printer. Each printer remains on a cart during its "life" on the factory floor, from the beginning of its assembly to its completion, so that it is easily moved. Near the end of the process is a continuous operation or "burn-in" period to weed out "infant mortality" as well as testing to ensure that every printer meets requirements.

This was a joint presentation between the IEEE Boston Reliability Chapter and the Northeast Chapter of the SMTA Association. This event also set an IEEE Boston Reliability Chapter record by reaching capacity in less than eight hours from the time we sent our first official email announcement to our members.

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

Upcoming Events

Reliability Chapter meeting on May 13, 2015 at 6:00 PM at MIT Lincoln Lab, MA.

"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.

As always, chapter meetings are open for IEEE members and non-members. 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.

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

Announcements

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

Vice-Chair- Jay Yakura

Past Secretary- Aaron DerMarderosian, Jr.

Treasurer- Don Markuson

Immediate Past Chair- Dan Weidman

Acting Secretary: Giora Kadem

ExCom and Past Chair – Ramon De La Cruz

Website – Jeff Clark

Newsletter, Social Media Editor- Neeta Agarwal

Publicity – Nihar Senapati

Membership – Alik Apelian

If you are an IEEE & Reliability Society (RS) 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/adcom.html>.

II. Regional Reliability Society Executive meeting

On Tuesday May 5, 2015, our regional RS joint section chair Charles Recchia attended the IEEE Providence Section Executive Committee Business Meeting in the Presidential Room at White's of Westport and presented information about the Reliability Society including upcoming meetings and conferences that would be of interest to the Section. He also suggested that the Reliability Chapter hold a future meeting at the Naval Undersea Warfare Center (NUWC) visitor's center (Bldg. 80). The suggestion was well received as it would likely be of interest of IEEE members working on Aquidneck Island.



Photograph (L to R): Gilmore Cooke, Steven Crocker, David Casper, Ted Dawson, Jason Gaudette, Charles Recchia, Cathy Ann Clark, Dave Clarke, Marty Cohen, Jacob George, Harold Belson, and Bill Horan. A number of former US presidents seemingly oversaw the entirety of the meeting.

III. Annual Reliability Chapter Awards

The IEEE Boston chapter was awarded the “third best” IEEE reliability Chapter in the world based on 2013 data. 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

Chapter Participation and Outreach Efforts

I. Leadership and membership development workshop

Many reliability chapter officers attended an officer's workshop coordinated by Paul Zorfass of IEEE Boston main section on Jan 22, 2015 6pm at the MIT Lincoln Lab Cafeteria. It was an interesting workshop and fun to meet officers from IEEE Boston's other societies in the northeast 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 great 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 Dr. Neeta Agarwal (neetaagar93@gmail.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
Newsletter available at the following link:**

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

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