November 2014 Newsletter

Joint Section Chapter: Boston - New Hampshire - Providence

September 2014 – November 2014

http://www.ieee.org/bostonrel

Greetings,

We've been having a great start to this academic year. In September 2014, the Quality Manager from the Agilent Technologies division that was formerly Varian Vacuum in Lexington, Massachusetts presented the transfer of technology from the US to Malaysia, with emphasis on the quality controls that made it successful. In October, we had a joint meeting with the ESDA-NE (ESD Association, Northeast Chapter) at Analog Devices, Inc. (ADI) in Wilmington, Massachusetts, where Bill Gaffney of ADI presented the top causes of failures of electronics, including ESD (electrostatic discharge) and counterfeits.

Looking back at our past academic year, September 2013 through June 2014, we have had a chapter record for number of attendees. Our tally was 489 people, due to more meetings, with remarkably similar attendance per meeting. To be specific, we had 40.8 people per meeting on average attending 12 meetings this past academic year ending in June 2014 compared to 41.6 people per meeting on average attending 9 meetings the previous academic year. Thanks to all our volunteers on the AdCom and to our members and guests who made this possible.

In November we will have a presentation on ESD protocols, which will be presented by Andrew Kopanski, the ESD expert at MIT Lincoln Laboratory. In December we will hold our annual past chairs meeting and are pleased the Eli Brookner, the radar expert, recently retired from Raytheon, has accepted our invitation as our guest speaker. We hope to see you at both of these meetings as well as those that we are planning for 2015. Whether you're reading this as part of our full newsletter or a snippet as part of the Reliability Society newsletter, whether this is online or hardcopy, you can always see our complete newsletter that is current and all our past newsletters on our web site: http://ewh.ieee.org/r1/boston/rl/newsletters.html

I have enjoyed my Chair position since the beginning of 2012, and this might be my last newsletter as Chair. My personal highlights have included hosting the monthly presentations, where I've met many interesting speakers and audience members. Chapter elections for the 2015 calendar year are coming up soon, and we have a roster of strong candidates running for the IEEE Boston Reliability AdCom (Advisory Committee) positions. This has been enjoyable for me due to the support of all my hardworking colleagues donating their time.

Best regards,
Dan Weidman, Ph.D.
2012-2014 Chair
IEEE Boston Reliability Chapter, joint with New Hampshire and Providence, Rhode Island
IEEE Senior Member

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October 8, 2014	Bill Gaffney, “Eliminating the Top Causes of Customer-Attributable Integrated Circuit Failures” at Analog Devices Inc., Wilmington, MA.
November 12, 2014	Andrew Kopanski, "ESD Control in a Laboratory Environment,". Meeting was jointly held with ESD Association, at MIT Lincoln Laboratory, Lexington, MA.

Upcoming Events:

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

December 10, 2014	"Reliability As Impacted by Phased-Array and Radar Breakthroughs" by Eli Brookner at MIT Lincoln Laboratory, Lexington, MA. Dr. Brookner is an internationally recognized radar expert, author of four books, recently retired from Raytheon and IEEE Distinguished Lecturer.
Wednesday, January 14 , 2015	Ted Dangelmayer, Dangelmayer Associates, LLC, “Class 0 and Reliability ESD Case Studies,” at MIT Lincoln Laboratory, Lexington, MA
Tuesday, February 10 , 2015	Jesús A. del Alamo, “Recent Progress in understanding the Electrical Reliability of GaN High-Electron Mobility Transistors,” at MIT Lincoln Laboratory, Lexington, MA
Wednesday, March 11, 2015	TBD

Recent Chapter Activities

"Maintaining Quality and Reliability of a Complex Product through a Global Manufacturing Transfer"

On Wednesday, September 10, 2014, we had our first monthly meeting after our usual summer hiatus. We were pleased to have Kevin Foy, Quality Manager of the Agilent Vacuum Products Division, speak to our group. His presentation covered the transfer of the manufacturing of leak detectors from Lexington, Massachusetts to Malaysia. First, Kevin described the technology of a helium mass spectrometer leak detector, which has been useful for several decades for detecting leaks in vacuum chambers, as well as leaks in small components. Kevin explained that to detect a leak in a vacuum chamber, the leak detector pumps down the vacuum chamber and then helium is sprayed from the outside at various locations; if any helium is detected, then there is a leak at that location. To detect a leak in a small part, such as a hybrid electronic component, that part is "bombed" with helium (i.e., placed in a high-pressure helium chamber for a while), and then placed in a small chamber on which the leak detector pumps; if any helium is detected, then the helium was from inside the small part. About 50 units per month are built. There are about a dozen different types, so there are only 1 or 2 units of some types and several of another type manufactured every month.

Then Kevin described the preparation for the manufacturing transfer. Metrics, such as the Annualized Failure Rate (AFR) and the Mean Time Between Failure (MTBF), were measured and targets for improvements were set. Documentation was expanded, detailed, and simplified so that work instructions could be understood by anyone of the four or five different cultures in Malaysia. About a dozen people from Lexington spent about 3 to 4 months in Malaysia. Customer fears of reduced quality were met head on with transparency, such as serializing units with numbers beginning with "US" if manufactured in Lexington and with "MY" if manufactured in Malaysia. It was mentioned that units remained in inches; they were not converted to metric. The source of electronic boards was changed from a manufacturer in New York to one in Malaysia.

IEEE Boston Reliability Chapter's Sept 2014 presentation

Kevin described some of the robust design features. The units can operate from -10C to 55C, with up to 95% relative humidity, and at a reduced ambient pressure equivalent to a customer in a location more than 10,000 feet altitude.

After the transfer, metrics from Malaysia were compared to those from Lexington. A couple of these metrics are mentioned above. If there is a failure within 45 days, that still counts as a Defect On Arrival (DEFOA), sometimes called an Out-Of-Box failure. Within 72 hours, either a replacement unit is shipped, or a service technician travels to the customer site. Warranty starts 30 days after shipment, to roughly account for shipping and installation time. A 13-month warranty is standard.

To avoid problems with shipping, such as delays in customs, Kevin described a clever process with logistics Centers (LCs) in various countries. This way, shipments from one country to another are from Agilent (US) to Agilent (LC), while the sale to the customer is within a country. The most vocal customers are those in the semiconductor industry, because a failure can shut down an entire wafer line.

Although this is a high-mix, low-volume product, the return on investment (ROI) is expected to be only about 2 to 3 years, because engineering labor is about one-third that of the US, the costs of some sheet-metal and machined parts will drop by about 70%, the Agilent factory space in Malaysia was available, and there will be reduced shipping costs to most of the customers, who are in Malaysia, Vietnam, Thailand, and other countries that are closer to Malaysia than to the US. Kevin Foy gave a very interesting and informative presentation.

"Eliminating the Top Causes of Customer-Attributable Integrated Circuit Failures."

On Wednesday, October 8, 2014, the IEEE Boston Reliability Chapter hosted monthly presentation, and this was a jointly held with IEEE Solid State Circuits Society meeting. Bill Gaffney of Analog Devices, Inc. (ADI) presented, with major contributions to the presentation from Andrew Olney, and the event was held at ADI in Wilmington, MA. The emphasis was on counterfeit electronics, which are electronics that

are not manufactured by the advertised manufacturer or are not handled by an authorized distributor. Such counterfeit components may pass quality inspections and functional tests, but may not be reliable. The top five categories of counterfeit parts are: recycled, lower grade, repackaged, non-functional, and re-engineered knock-offs. Recycled components are intercepted by counterfeiters before being destroyed. Lower grade components can be sanded and then remarked as a higher grade. Repackaged components can involve removing a die from a package and inserting the die into a new package. Non-functional components may be mixed in with functional components so that sample testing or "screening" tests pass. Re-engineered knock-offs may be manufactured to replicate functionality, but without authorization from the original component manufacturer and without access to the original designs and may result is lower reliability over time or for various operating parameters within the specified ranges of operation.

The counterfeiting was almost unknown until about 1999 when recycling of electronics started. Some counterfeiters take cheap parts (less than $1 each), and repackage them with military-specification markings to be sold for much more (about $100 each). To prevent re-use of discarded ADI components, such components are crushed to dust with steel balls the size of bowling balls in a large tumbler. Since 2001, it has been illegal to ship electronic waste (e-waste) to China; nevertheless, about 16 billion pounds of e-waste is shipped to China annually.

The most effective way to avoid counterfeit electronics is to purchase only from the manufacturer or from an authorized distributor. An authorized distributor of ADI, for example, signs a contract that they cannot buy ADI components from any other source, even if there is a parts shortage. Rochester Electronics, for example, is an electronics distributor with agreements with 68 manufacturers.

Non-authorized distributors may claim to provide a warranty, but such a warranty may require onerous tasks, such as a failure analysis (FA) from the original component manufacturer (OCM). However, an OCM will usually not perform a FA for a component that was not sold by them or by an authorized distributor, because there may be legal problems that arise if an OCM tries to assert whether a part is counterfeit.

The event had an excellent turnout, with quite a full room. We are thankful to ADI and the people there for their generosity for this event.

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

"ESD Control in a Laboratory Environment" by Andrew Kopanski

On Wednesday, November 12, 2014, Andrew Kopanski presented, "ESD Control in a Laboratory Environment." This presentation was at MIT Lincoln Laboratory, in Lexington, Massachusetts, and focused on ESD Class 0 protocols, which mitigate electrostatic discharge that can damage sensitive electronics. This presentation was held jointly with the NE-ESDA (Northeast chapter of the ESD Association). When introducing the speaker, Dr. Daniel J. Weidman, the IEEE Boston Reliability Chapter Chair, pointed out that Moore's Law has continued to hold steady, with the number of transistors in a given area doubling every 2 years. This corresponds to halving the linear dimension in less than three years, and the linear dimension corresponds to voltage hold-off or electric field. In other words, the sensitivity or voltage threshold for ESD is halving every three years, which is faster than a new standard can be written, and is perhaps faster than an existing standard can be revised. As a result, electronics sensitivity to ESD is outpacing the ability to formally standardize protocols, thereby making ESD one of the biggest reliability issues for electronics. When Andrew Kopanksi started speaking, he gave an example of the practical consequences of this. Several years ago, when setting up the ESD program at

MIT Lincoln Laboratory, a simplified set of protocols was put into place called ESD Class 1 and ESD Class 0. (The smaller the number the lower the voltages for more sensitive electronics.) ESD Class 2 was ignored, because such protocols addressed relatively high voltages and were obsolete for most electronics, which had become more and more sensitive over the years. Then, after only a few years (about a year ago), protocols were changed at MIT Lincoln Laboratory for incoming inspection of electronics from ESD Class 1 (with Class 0 as needed) to simplyESDClass0always.

Andrew went on to describe various other practical considerations, such as why softer mats are more effective than ESD-dissipative hard surfaces and why the use of polonium-210 alpha ionizers is more reliable than electrical corona ionizers. Andrew explained that various tools, such as cutters, pliers, and screwdrivers, need to have their "working ends" made of metal, not dissipative material, so that they are sufficiently strong. As a result, these tools must be grounded when picked up by a grounded person and must remain grounded for all motions. Some tools have insulating handles, and some tools do not have continuous electrical contact between the working end and the handle. In fact, when testing various items sold as ESD-safe, including tools, materials, equipment, furniture, notebooks, and gloves, for example, only about half pass requirements. Sometimes there are items that are not sold as ESD-safe that perform better than a similar item that is sold as ESD-safe. We had good attendance for this presentation and we are grateful to MIT Lincoln Laboratory for their help providing the facility, audio equipment and projector and their set-up, and refreshments. The NE-ESDA contributed support for the refreshments.

Andrew Kopanski's presentation on Nov 12, 2014 monthly meeting

From Reliability Desk

Computer Reliability History

The Whirlwind computer was one of the first digital computers. The invention of magnetic core memory mitigated reliability problems. A description of magnetic core memory as a significant reliability improvement is at the IEEE web site:
http://www.ieeeghn.org/wiki/index.php/Milestones:Whirlwind_Computer

Recently Dr. Weidman (current Chapter Chair) had the opportunity to chat with Walter E. Morrow, Jr., who was the Director of MIT Lincoln Laboratory from 1977 to 1998. Mr. Morrow explained that there was a process of checking computer performance (reliability mitigations) and the vacuum tubes before each run, and replacing all failed and questionable vacuum tubes, thereby reducing the chance of a failure during a calculation. MIT has a web page for him:
http://mit150.mit.edu/infinite-history/walter-e-morrow-jr-%E2%80%9949-sm-%E2%80%9951

Upcoming Events

Reliability Chapter meeting on December 10, 2014 at 6:00 PM at MIT Lincoln Labs, MA.
"Reliability As Impacted by Phased-Array and Radar Breakthroughs"
by Eli Brookner, who is an internationally recognized radar expert, author of four books, recently retired from Raytheon and IEEE Distinguished Lecturer.
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

I. Chapter Annual elections for AdCom- IEEE Boston Reliability Chapter, Joint with New Hampshire & Providence

2015 Office Contesting Candidates: (Profiles & Experience posted on the voting page)
Chair- Charles Recchia
Vice-Chair- Jay Yakura
Secretary- Aaron DerMarderosian, Jr.
Treasurer- Don Markuson
You must be an IEEE & Reliability society member in the IEEE Boston, New Hampshire, or Providence sections and membership number is required to vote. Voting deadline: Friday, December 5th @COB
And vote at Web link: 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

Chapter Participation and Outreach Efforts

I. Obituary

It is with great sadness that I announce the passing of Michael A. Silverman. Mike owned and operated Ops A La Carte LLC, providing training, testing, and reliability engineering consulting services to companies around the world. Mike was a leader and an active contributor to the Reliability profession. He was a dedicated and hard worker who provoked people to think outside the box. He was well liked and admired by many. Mike, age 50, passed away peacefully at home surrounded by family on September 13th after a valiant 14 month battle with cancer. His positive outlook on life was an inspiration to the end. The IEEE Boston Reliability Chapter, on behalf of our entire membership and the greater reliability engineering community, made a donation in his memory. At the family's request, we donated to March of Dimes, Colorado Chapter, 1325 S. Colorado Blvd. Suite B-308 Denver, CO 80222. More information is available at:
http://www.legacy.com/guestbooks/mercurynews/michael-a-silverman-condolences/172468223
If you would like to make a small donation in his memory please use link
https://www.marchofdimes.org/colorado/support_giving.html

II. Chapter Seeks Volunteers

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

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

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