The EOS/ESD Association, Inc. newsletter, published for everyone with an interest in the understanding and control of electrostatic discharge.

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2015 EXECUTIVE COMMITTEE
President – Terry Welsher
Sr. Vice President – Gianluca Boselli
Vice President – Ginger Hansel
Treasurer – John Kinnear
Secretary – Alan Righter
Past President – Leo G. Henry
Director of Operations – Lisa Pimpinella (Appointed)

2015 BOARD OF DIRECTORS
(Last year of term follows name)
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Reinhold Gaertner (16) Scott Ward (15)

Watch for the Threshold E-Newsletter by email!
Welcome to ESDA 2015!

Kevin will be leaving the Board because of company work commitments. I hope he will still be an active and strong contributor in Standards, Education, and the other areas he has participated to in the past. At the same time I welcome newly elected BoD member, Brett Carn. As a member of the Education Council, Brett has been leading the implementation of our growing On Demand Curriculum and of course has been a strong contributor to the progress of the Joint HBM and CDM standards. Welcome, Brett! BoD members who were re-elected to new 3-year terms for 2015 were Charvaka Duvvury, Harald Gossner, and Misha Khazhinsky.

The Business Unit Managers for 2015 will be Nate Peachey (Standards), Alan Righter (IEW), Gianluca Boselli (Symposium), Ginger Hansel (Education), Michael Khazhinsky (Advanced Topics), David E. Swenson (Membership & Volunteer Activities), Harald Gossner (Marketing & Communications), and Reinhold Gaertner (Factory Symposia). I am especially pleased that Harald has agreed to lead and revitalize our marketing effort. Harald has correctly observed that we have more projects we would like to do than we have volunteers to do them. Deploying resources efficiently depends on understanding markets, technology, stakeholders, and customers. At our recent annual BoD meeting in Rome, he presented a blueprint for a strategic approach to marketing and overall ESDA project selection that aims to improve our focus and maximize impact. We are looking forward to working with this new process in the coming year.

In 2015 we will continue to evolve as an international organization. Education events and Symposia are planned in India, Korea, Thailand, and China with more under consideration. This is in addition to Regional Local Chapter events, a special education event in Rome, NY in February, the IEW in Lake Tahoe during May, and the EOS/ESD Symposium in Reno, Nevada at the end of September. We also anticipate having our first face-to-face Standards Working Group Meeting (Flat Panel Displays) outside the U.S. in conjunction with the Korea Symposium in June. Check the ESDA website frequently for news and updates on these events. Finally, ESDA is in the final stages of reaching a Memorandum of Understanding with the Chinese standards organization CNIS (China National Institute of Standardization) on wide range of standards issues including re-selling of ESDA standards in China and CNIS participation in ESDA Standards Development.

Another important change coming in 2015 is the launching of a brand new ESDA website with a new look and feel and many new features. The ESDA owes special thanks to long time volunteer Bill DeJean and his staff at TDI for helping us jump start this project. Look for the new site to be up and running April 1, 2015.

Our continued strategic planning and execution has resulted in major transformations in the organization and the way we operate and there will be more changes to come. As I said in this same message last year - we may have missed something. Please feel to send ideas and comments. You can use the “suggestion box” icon on the ESDA home page, or e-mail to suggestion@esda.org.

Finally, I would like to wish all of you a safe, healthy, and prosperous New Year.

Terry Welsher
ESD Association President; Terry Welsher

With this being the midpoint of my term as President I am reflecting backward while looking forward. 2014 has been quite a year for the ESDA. The list of accomplishments, new events, new locations, and new partnerships is long and many of them have been reviewed in the previous 2014 articles in Threshold or in my previous messages. I could easily spend most of the space allotted for my message here discussing and celebrating them. However, in this message I would like to emphasize the future and what is coming in 2015. I am again pleased to be working with Sr. Vice President of Business Operations, Gianluca Boselli and Vice President of Technical Operations, Ginger Hansel. Rounding out the 2015 executive team are John Kinnear, Treasurer; Alan Righter, Secretary; and Leo G Henry, Past President. I want to give special thanks to outgoing Treasurer, Donn Pritchard. Donn has retired from Monroe Electronics and will be reducing his ESDA involvement. I want to personally thank Donn for his steadfast dedication to all of the roles he has played in his eighteen years with ESDA and wish him the best in this next stage of life. I also want to thank outgoing BoD member Kevin Duncan.
**ESD Association 2015 Organizational Charts**

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Ginger Hansel, Vice President

Director of Operations
Lisa Pimpinella

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Gianluca Boselli, Sr. Vice President

Headquarters
Lisa Pimpinella

Membership & Volunteer Activities
David Swenson

Marketing & Communications
Harald Gossner

Standards
Nate Peachey

Advanced Topics
Michael Khazhinsky

Symposium
Gianluca Boselli

Factory (Int’l) Symposium
Reinhold Gaertner

Education
Ginger Hansel

IEW
Alan Righter

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ESD Association
2015 Business Operations
Organizational Chart
SIGNIFICANT CHANGES MADE FROM THE 2007 VERSION TO THE 2014 VERSION OF ANSI/ESD S20.20

1. There were changes in the scope of the program. Values for CDM and isolated conductors are now included in the 2014 version.

<table>
<thead>
<tr>
<th>2007 Version</th>
<th>2014 Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>This document applies to activities that manufacture, process, assemble, install, package, label, service, test, inspect, transport or otherwise handle electrical or electronic parts, assemblies and equipment susceptible to damage by electrostatic discharges greater than or equal to 100 volts HBM. Activities that handle items that are susceptible to less than 100 volts HBM may require additional control elements or adjusted limits. Processes designed to handle items that have an ESD sensitivity less than 100 volts HBM can still claim compliance to this standard. This document does not apply to electrically initiated explosive devices, flammable liquids or powders.</td>
<td>This document applies to activities that manufacture, process, assemble, install, package, label, service, test, inspect, transport or otherwise handle electrical or electronic parts, assemblies and equipment susceptible to damage by electrostatic discharges greater than or equal to 100 volts HBM, 200 volts CDM, and 35 volts on isolated conductors. Activities that handle items that are susceptible to lower withstand voltages may require additional control elements or adjusted limits. Processes designed to handle items that have an ESD sensitivity to lower withstand voltages can still claim compliance to this standard. This document does not apply to electrically initiated explosive devices, flammable liquids or powders.</td>
</tr>
</tbody>
</table>

2. The tailoring section was updated to clarify what needs to be tailored. For example, limits were changed but are still within the limits in ANSI/ESD S20.20 do not require a tailoring statement. Only limits that are outside ANSI/ESD S20.20 and deleting requirements require tailoring statements.

<table>
<thead>
<tr>
<th>2007 Version</th>
<th>2014 Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>This document, or portions thereof, may not apply to all applications. Tailoring is accomplished by evaluating the applicability of each requirement for the specific application. Upon completion of the evaluation, requirements may be added, modified or deleted. Tailoring decisions, including rationale and technical justifications, shall be documented in the ESD Control Program Plan.</td>
<td>This document, or portions thereof, may not apply to all applications. Tailoring is accomplished by evaluating the applicability of each requirement for the specific application. Upon completion of the evaluation, requirements may be deleted or modified outside the limits of this standard. Tailoring decisions, including rationale and technical justifications, shall be documented in the ESD Control Program Plan.</td>
</tr>
</tbody>
</table>
3. A section on Product Qualification was added. While this requirement was in the 2007 version it was often overlooked. The requirements for product qualification only existed in the tables for the 2007 version. The 2014 version has a specific section that now requires the product qualification plan.

<table>
<thead>
<tr>
<th>2007 Version</th>
<th>2014 Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did not exist</td>
<td>7.3 Product Qualification Plan</td>
</tr>
</tbody>
</table>

A Product Qualification Plan shall be established to ensure that the ESD control items that have been selected meet the requirements in the plan. The test methods and required limits are located in the product qualification columns in Tables 2 and 3. Product qualification is normally conducted during the initial selection of ESD control items. Any of the following methods can be used: product specification review, independent laboratory evaluation or internal laboratory evaluation. For ESD control items that were installed by the Organization before the adoption of this standard, on-going compliance verification records can be used as evidence of product qualification.

4. The requirements to the qualification of the flooring/footwear systems has changed. The 2007 version allowed for qualification based only on resistance if the total resistance was less than 3.5x10^7 ohms. A walking test was required for resistance greater than 3.5x10^7 and less than 1x10^9 ohms. The resistance method (Method 1) has been eliminated and the requirement is now a resistance and walking test.

### 2007 Version

<table>
<thead>
<tr>
<th>Personnel Grounding Technical Requirement</th>
<th>Product Qualification&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Compliance Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrist Strap System&lt;sup&gt;2&lt;/sup&gt;</td>
<td>ANSI/ESD S1.1 (Section 5.11)</td>
<td>ESD TR53 Wrist Strap Section</td>
</tr>
<tr>
<td></td>
<td>&lt; 3.5 x 10&lt;sup&gt;7&lt;/sup&gt; ohms</td>
<td></td>
</tr>
<tr>
<td>Flooring / Footwear System – Method 1</td>
<td>ANSI/ESD STM97.1</td>
<td>ESD TR53 Flooring Section</td>
</tr>
<tr>
<td></td>
<td>&lt; 3.5 x 10&lt;sup&gt;7&lt;/sup&gt; ohms</td>
<td></td>
</tr>
<tr>
<td>Flooring / Footwear System – Method 2 (both required)</td>
<td>ANSI/ESD STM97.1</td>
<td>ESD TR53 Flooring Section</td>
</tr>
<tr>
<td></td>
<td>ANSI/ESD STM97.2</td>
<td>ESD TR53 Footwear Section</td>
</tr>
<tr>
<td></td>
<td>&lt; &lt;100 volts</td>
<td></td>
</tr>
</tbody>
</table>

### 2014 Version

<table>
<thead>
<tr>
<th>Technical Requirement</th>
<th>Product Qualification&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Compliance Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrist Strap System&lt;sup&gt;2&lt;/sup&gt;</td>
<td>ANSI/ESD S1.1 (Section 6.11)</td>
<td>ESD TR53 Wrist Strap Section</td>
</tr>
<tr>
<td></td>
<td>&lt; 3.5 x 10&lt;sup&gt;7&lt;/sup&gt; ohms</td>
<td></td>
</tr>
<tr>
<td>Footwear / Flooring System&lt;sup&gt;5&lt;/sup&gt; (Both limits must be met)</td>
<td>ANSI/ESD STM97.1</td>
<td>ESD TR53 Footwear Section</td>
</tr>
<tr>
<td></td>
<td>ANSI/ESD STM97.2</td>
<td>ESD TR53 Flooring Section</td>
</tr>
<tr>
<td></td>
<td>&lt; 100 volts Peak</td>
<td></td>
</tr>
</tbody>
</table>

Continued on page 8
5. Process Required Insulators - In the 2007 version of ANSI/ESD S20.20 the requirement on process required insulators within 30 cm (12 in) of an ESD sensitive device is for a field of no more than 2000 volts/in. In the 2014 version of the standard, there is a new requirement that process required insulators within 2.5 cm (1 in) of an ESD sensitive device have a field of no more than 125 volts/in.

<table>
<thead>
<tr>
<th>2007 Version</th>
<th>2014 Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process required insulators within 30 cm (12 in) have a field of no more than 2000 volts/in.</td>
<td>Process required insulators within 30 cm (12 in) have a field of no more than 2000 volts/in.</td>
</tr>
<tr>
<td>No requirement</td>
<td>Process required insulators within 2.5 cm (1 in) have a field of no more than 125 volts/in.</td>
</tr>
</tbody>
</table>

6. Isolated Conductors - The 2007 version of ANSI/ESD S20.20 did not have any requirements on isolated conductors. In the 2014 version of ANSI/ESD S20.20, isolated conductors that come into contact with ESD sensitive devices cannot have more than 35 volts on the conductor.

<table>
<thead>
<tr>
<th>2007 Version</th>
<th>2014 Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>No requirement</td>
<td>When establishing an ESD Control Plan, if a conductor that comes into contact with an ESDS item cannot be grounded or equipotentially bonded, then the process must ensure that the difference in potential between the conductor and the contact of the ESDS item is less than 35 volts.</td>
</tr>
</tbody>
</table>

7. Table 3 Changes and updates - Ionization now has one offset limit instead of the two requirements in the 2007 version. The 2007 version has separate limits for room ionization and local ionization. The 2014 version now has only one limit. If room ionization is used and the offset cannot be achieved a tailoring statement must now be part of the ESD control plan.

2007 Version

<table>
<thead>
<tr>
<th>Ionization other than Room Systems</th>
<th>ANSI/ESD STM 3.1</th>
<th>ESD TR53&lt;sup&gt;3&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Discharge time</td>
<td>User defined</td>
<td>User defined</td>
</tr>
<tr>
<td>- Offset voltage</td>
<td>&lt; ± 50 volts</td>
<td>&lt; ± 50 volts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ionization (Room Systems)</th>
<th>ANSI/ESD STM3.1</th>
<th>ESD TR53&lt;sup&gt;3&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Discharge time</td>
<td>User defined</td>
<td>User defined</td>
</tr>
<tr>
<td>- Offset voltage</td>
<td>&lt; ± 150 volts</td>
<td>&lt; ± 150 volts</td>
</tr>
</tbody>
</table>

2014 Version

<table>
<thead>
<tr>
<th>Ionization</th>
<th>ANSI/ESD STM3.1</th>
<th>Discharge Time</th>
<th>ESD TR53&lt;sup&gt;3&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>- User defined</td>
<td></td>
<td>User defined</td>
<td></td>
</tr>
<tr>
<td>- Offset Voltage</td>
<td></td>
<td>-35 &lt; V&lt;sub&gt;offset&lt;/sub&gt; &lt; 35</td>
<td>Section</td>
</tr>
</tbody>
</table>

Continued on page 9
8. Electrical Soldering/Desoldering Hand tools were also added as a requirement to Table 3. This is new to the 2014 version and was not in the 2007 version.

2014 Version

9. Another addition to Table 3 is the requirement to check the wrist strap connection. This is the connection from where the wrist strap is plugged in to ground. This is for non-continuously monitored wrist straps.

2014 Version

10. Packaging - It has been found that packaging materials have been used as worksurfaces and there is some confusion on the requirements. The following note has been added to the packaging section of ANSI/ESD S20.20–2014. “When ESDS items are placed on packaging materials and the ESDS items have work being performed on them, then the packaging materials become work surfaces. The worksurface requirements for resistance to ground apply.”

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2015 ESD Factory Symposium in Korea

Call For Presentations

Submission Deadline- Jan 29, 2015

June30-July 3, 2015 - Conference Center, COEX in Seoul, KOREA

Please email your presentation abstract including title, author affiliation, and email address to info@esda.org

For questions please contact the Technical Program Chair: Joshua Yoo at Joshua@coreinsight.co.kr.
Mayank Shrivastava, ESDA Spotlight Volunteer

Mayank Shrivastava received the B.S. degree in engineering from RGTU, Bhopal, India, in 2006 and the Ph.D. degree from the Indian Institute of Technology (IIT) Bombay, Mumbai, India, in 2010. From April 2008 to October 2008 and again in May 2010 to July 2010, he was a Visiting Research Scholar with Infineon Technologies AG, Munich, Germany. During 2010-2011, he worked for Infineon Technologies, East Fishkill, NY, and later Intel Mobile Communications, Hopewell Junction, NY, as an ESD device and technology co-design responsible within International Semiconductor Development Alliance (ISDA). Since Oct. 2011 he is with Intel, Mobile & Communications Group, Munich Germany. In September 2013 he joined as a faculty in the Department of ESE at the Indian Institute of Science, Bangalore, India. Dr. Shrivastava has over 35 publications in international journals/conferences and has 16 patents issued or pending in the field of Electric device protection, drain extended MOS devices, FinFET transistors, Tunnel field-effect transistors (TFETs), device-circuit co-design, electrothermal modeling, RF power amplifiers and nonvolatile memory.

Dr. Shrivastava was a recipient of the India TR35 award for the year 2010 (Young Innovator Award from MIT Technology Review 35); 2008 Best Research Paper Award in circuit design category from Intel Corporation Asia Academic Forum; the 2010 Industrial Impact Award from IIT Bombay; the biography publication by the International Biographical Center, Cambridge, U.K., in the 2000 Outstanding Intellectuals of the 21st Century in 2010; the Excellence in Thesis work for his Ph.D. thesis from IIT Bombay in 2010 and Infineon PhD fellowship from 2008-2010. He has given many invited talks including an invited tutorial at the 2013 International ESD workshop. He has served in the technical program committee of EOS/ESD symposium in 2012 and again in 2013. He has also served as a reviewer for various international journals, which include the IEEE Transactions on Electron Devices, IEEE Electron device letters, IEEE Transactions on Device and Materials Reliability, Japanese Journals of applied physics, and the Journal of Microelectronics Reliability.
Q&A

Q. Our question is about the test method for wrist strap bending life. We are curious about the weight hanging approach. Should it be hanged without any supporting fixture? Is there any improper points? How can we improve?

A. The main idea is to have the cord go through a 120 degree cycle relative to the ground cord termination end with a weight of 1 pound (453.6 grams) attached to the cord. The cord can be guided so that the whole cord does not swing around causing extra strain on the connection. It appears that you are guiding the cord with the rollers just above the weights so as long as they do not catch or hold the cord it should be fine. If you test coil cords, make sure the weights are attached to the straight part of the cord and not into the coils since that would cause oscillation (bouncing).

Follow up questions:

Q. After the test, if we find the cord jacket or coil broken, but the cord resistance is within the limit, should the test be passed?

A. The rules for judging failure include any breaks in the strain relief, even if the electrical resistance is still OK. We understand that the coil cord is difficult to test. Just make sure the weight is on the straight section and guided by the rollers and that is about the best you can do.

Additional follow up questions:

After discussing with our engineers, we still have some doubts about the wrist strap bending life test. They are as follows:

Q1: We use a fixture to fix one end of the ground cord to the rocker plate, will that be OK?

Q2: A weight of one pound is for the whole ground cord, but now we just test the straight parts of the ground cord, which means the strain relief or the coil and other parts are nearly not under stress. Should the coil be tested? If our test includes the coil, can the weight be placed on the ground or just hanging in the air (cause bouncing, hard to control)?

Q3: In the standard, a ground cord failure is defined by 2 conditions (R>1.25megohms or visual mechanical failure of the jacket or coil), the latter condition is hard to detect and our current test excludes the coil. Should our test include the coil?

For clarification:

A-1 yes it is fine to use the fixture to hold the end of the ground cord as indicated. The strain relief must be free to move through 120 degrees angle.

A-2 only put the weight on the straight part of the cord. If it is on the coil cord there will be too much bouncing. You are only measuring the life of the strain relief in this test, not the cord.

A-3 as above, the strain relief may start to show fatigue and cracks. That is usually the first sign of failure even before there is any electrical change.

Making sure the weights do not bounce is the main thing - the weight may sway side to side, this can be controled with the rollers if desired.

The response given is a service to industry; the ESDA is not responsible for content. The users of this information need to determine the suitability of the response.

Did You know?

Being certified can mean many things. For the ESD Association it means an understanding far greater than just material in a notebook. To become certified as a Professional Program Manager, Device Design Professional, or Device Stress Testing Certified through the ESDA, you make a commitment to learning, practicing, and displaying an understanding of the concepts behind the courses that are required.

The ESD Associations Certified Professionals have worked hard to achieve their certification and the ESDA is proud to recognize all of our certified professionals.

New 2015 Certified Professional Program Managers:

Frank Biege
Hella KGaA Hueck & Co.

Joe Collins
General Dynamics AIS

David Kirk
Hologic

Stephen Hilbert
B & W Pantex

Joseph Kane
BAE Systems

Soon Guan Yon
Freescale Semiconductor Malaysia

Inderjit Singh
Cesstech (S) Pte., Ltd.

Stevan Hunter
ON Semiconductor

Dennis Wells
M/A-COM Technology Solutions

Gregory O'Sullivan
Micron Semiconductor, Inc.

Michael Schumacher
Enics Switzerland, Ltd.
Calendar of Events

January 8-9, 2015
ESD Design Essentials
The Oberoi, 39, Mahatma Gandhi Rd, Bangalore, Karnataka 56000, India

February 10-11, 2015
Fundamental Handling Practices, Basic ESD Control Program, and Simplified Measurements
EOS/ESD Association Inc.
7900 Turin Rd Bld 3 • Rome NY 13440

March 24-25, 2015
Texas Local Chapter Tutorials
FC360: Electrical Overstressing in Manufacturing and Test
FC361: Advanced ESD/EMI/EOS Auditing Techniques
Electric Fields - Practical Considerations for the Factory
Electrostatic Attraction and Particle Removal
3M Innovation Center, Austin, TX

April 12-16, 2015
Electrostatics 2015
Southampton Solent University, Southampton, UK
http://elec2015.iopconfs.org

May 4-6, 2015
9th Annual International Electrostatic Discharge Workshop (IEW)
Granlibakken Conference Center & Lodge
Lake Tahoe, CA

May 7-11, 2015
ESD Association Meeting Series
Peppermill Resort and Casino, Reno, NV
(Room Rate $95/night)

May 19-21, 2015
Northeast Local Chapter Tutorials
• FC100: ESD Basics for the Program Manager
• FC101: How To’s of In-Plant ESD Auditing and Evaluation Measurements
Teradyne Conference Center
600 Riverpark Drive • North Reading, MA

June 30-July 1, 2015 ESD Factory Tutorials
July 1, 2015 ESD Design Tutorials
July 2-3, 2015 EOS/ESD Symposium and Exhibition
Conference Center, COEX in Seoul, KOREA

September 24-October 2, 2015
ESD Association Meeting Series
Peppermill Resort and Casino, Reno, NV
EOS/ESD Symposium and Tutorials
Peppermill Resort and Casino, Reno, NV
(Room Rate $125/night)

Registration for onsite Tutorials available online at
www.esda.org/onlineregistrations
Threshold™ Publication Schedule

<table>
<thead>
<tr>
<th>Issue</th>
<th>Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>January/February</td>
<td>Nov. 19</td>
</tr>
<tr>
<td>March/April</td>
<td>Feb. 1</td>
</tr>
<tr>
<td>May/June</td>
<td>April 1</td>
</tr>
<tr>
<td>July/August</td>
<td>June 1</td>
</tr>
<tr>
<td>September/October</td>
<td>Aug. 1</td>
</tr>
<tr>
<td>November/December</td>
<td>Oct. 1</td>
</tr>
</tbody>
</table>

Threshold Institutional Listings

Space in the Threshold Institutional Listings, which appear at the bottom of newsletter pages, can be purchased for $600.00 for six consecutive issues. Listings will also appear in the online calendar. Larger contributions are welcome. No agency fee is granted for soliciting such contributions. Inquiries, or contributions made payable to the ESD Association, should be sent to:

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E-mail: info@esda.org

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The “Wizards” and the “Magic” of ESDA make for a winning team!