

2017

EOS/ESD Association, Inc.

Regional Tutorials

Schedule multiple ESD training courses at one time!

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TEXAS

March 7-8, 2017 Texas Regional Tutorial Program

March 7 FC165: Novel Methods for Fixing ESD Issues in the Factory for Both Electronics & Explosive Products

FC261: Electrical Fields - Practical Considerations for the Factory

March 8 FC360: Electrical Overstress in Manufacturing and Test

FC361: Class 0A Devices & Boards - ESD Controls and Auditing Measurements

3M Innovation Center, 6801 River Place Blvd., Austin, TX 78726

MASSACHUSETTS

May 17-19, 2017 Northeast Regional Tutorial Program

May 17 FC100: ESD Basics for the Program Manager

May 18 FC101: How To's of In-Plant ESD Auditing and Evaluation Measurements

May 19 FC150: Hands-on ESD Measurements & Instruments - Uses and Pitfalls

ANSI/ESD S20.20-2014 Changes, Implications, and Test Methods

Teradyne Conference Center, 600 Riverpark Drive, North Reading, MA

NEW YORK

June 13-15, 2017 Regional Tutorial Program

June 13-14 ESD Program Development & Assessment (ANSI/ESD S20.20 Seminar)

June 15 ESD Certified Professional Program Manager Exam

EOS/ESD Association, Inc., 7900 Turin Rd. Bldg 3, Rome, NY 13440

December 4-5, 2017 Regional Tutorial Program

Dec 4 FC170: ESD Training for Internal Auditors and Supplier Quality

Dec 5 FC164: Costly Controversial ESD Myths

FC161: Perfect ESD Storm

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2017 EOS/ESD Association, Inc. Texas Regional Tutorials

March 7-8, 2017

3M Innovation Center, 6801 River Place Blvd., Austin, TX 78726

March 7, 2017

8:30 AM - 12:00 PM

FC165: Novel Methods for Fixing ESD Issues in the Factory for Both Electronics & Explosive Products

Jay Skolnik, Skolnik Technical Training

This class will be a 3-hour tutorial on ESD control for explosives and other energetic materials, introducing the students to the differences of ESD damage of electronics versus energetics. It will discuss the various energy levels and types of discharges which can cause catastrophic or latent failures. Enlightening demonstrations and case histories will be included to illustrate practical, real-life situations of past ESD-induced failures of energetic components and methods to prevent them, as well as explanations of the use of ESD mitigation in the work environment. Upon tutorial completion, the students should be able to understand ESD and the prevention of ESD failures by applying the proper mitigation & control techniques, as well as safely work with explosive applications while ensuring human safety, preventing catastrophic health hazards, injuries, and severe damages.

1:00 PM - 4:30 PM

FC261: Electrical Fields-Practical Considerations for the Factory

David E. Swenson, Affinity Static Control LLC

ANSI/ESD S20.20 recommends that process essential insulators with a measured electrical field strength of >2000 volts at 1 inch should be kept a minimum of 12 inches from ESD susceptible items. In addition, for close proximity or contact, the standard requires that insulators have an electric field of <125 volts at 1 inch. Just what are the practical considerations of this statement? What is the size of a charged object that imposes a risk? The goal of this tutorial is to show, by demonstration, the field strength and resulting induction ability from different sized objects. The audience should gain a practical perspective of size and distance as related to electrical fields and induction and be able to relate the information to their own factory situations.

March 8, 2017

8:30 AM - 12:00 PM

FC360: Electrical Overstress in Manufacturing and Test

Terry Welsher, Dangelmayer Associates LLC

Electrical overstress (EOS) is a major cause of device failure in manufacturing and in the field. Despite this, there is relatively little information on the sources of EOS and on prevention practices, particularly for the factory. In this tutorial, the fundamentals of device overstress are reviewed. Relationships among device EOS stressing models, such as the Wunsch-Bell curve, are discussed. The causes of EOS and EOS-like events in manufacturing are described and categorized by source and by stress-type. The difficulties in distinguishing between power-induced EOS and high current ESD events such as charged-board events (CBE) and cable discharge events (CDE) are discussed. Case histories, including failure analysis and root cause determination, are presented and the few relevant industry specifications are reviewed.

1:00 PM - 4:30 PM

FC361: Class 0A Devices & Boards - ESD Controls and Auditing Measurements

Terry Welsher, Dangelmayer Associates LLC

Advanced ESD Controls and Auditing Measurements for CDM & Class 0 (ultra-sensitive) devices and Circuit Boards are not well known and there are many technical and strategic pitfalls that must be avoided. Industry definitions (threshold levels) for Class 0 will be described and the history of their use will be reviewed. The Class 0 category is broken down into sub-categories of increasing risk. Students will learn how to make valid measurements, avoid common pitfalls, and how to use this data to successfully handle Class 0 sensitivities. Advanced measurements will be described including event detection and high speed current measurements. Students will learn when each measurement type is useful. Compelling case studies will illustrate these techniques and the success they produce.

ESD Control procedures for Class 0 manufacturing require customization, attention to detail and a full understanding of the technology. Thus, each company will need to develop a Class 0 ESD subject matter expert (SME) to ensure the correct and cost effective counter measures are taken. SOPs (Special Operating Procedures) developed by SMEs will be discussed that have proven to virtually eliminate Class 0 failures.

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2017 EOS/ESD Association, Inc. Northeast Regional Tutorials

May 17-19, 2017

Teradyne Conference Center, 600 Riverpark Drive, North Reading, MA

May 17, 2017

8:00 AM - 5:00 PM

FC100: ESD Basics for the Program Manager Certification: PrM

Ted Dangelmayer, Terry Welscher, Dangelmayer Associates LLC

This tutorial provides the foundation material for understanding electrostatics and ESD and their role in the manufacturing and handling of ESD sensitive devices. The fundamental properties of charge, electric fields, voltage, capacitance, and current are discussed with a view towards understanding key electrostatic phenomena and electrical processes. These include charge generation and decay, material properties, and induction. An overview of device failure mechanisms is presented, including how these models impact ESD control programs. Finally, the course provides an overview of ESD control procedures during handling and manufacturing and an overview of ANSI/ESD S20.20 program requirements. This full day course is required for those in-plant auditors and program managers who are working toward professional ESD certification. The presentation includes many in-class demonstrations, videos, and animated slides.

Some sample topics covered in this course are:

- Definitions and relationships among important electrical and mechanical properties
- Causes of charge generation and decay
- Field effects and voltages
- Role of capacitance in ESD ($Q=CV$)
- Overview of key measurements including common pitfalls of some measurements
- Review of ESD failure models
- Understanding and demonstrating electrostatic induction
- Utility and limitations of air ionization
- Basic goals of ESD controls
- Properties of effective ESD control products and materials
- Overview of ANSI/ESD S20.20 ESD program development requirements

May 18, 2017

8:00 AM - 5:00 PM

FC101: How To's of In-Plant ESD Auditing and Evaluation Measurements Certification: PrM

Ted Dangelmayer, Dangelmayer Associates LLC

Compliance verification is one of the most important elements of ESD program management and there are many technical and administrative pitfalls that can be avoided. The attendee will learn not only how to make valid auditing measurements in accordance with ESD TR53 – Compliance Verification of ESD Protective Equipment and Materials, but also how to recognize and avoid common pitfalls. Common instruments will be explained as well as the invalid test results that can result when they are used incorrectly. Advanced auditing techniques will also be covered that enable Class 0 devices to be handled successfully. There are many ways to administer effective Compliance Verification programs. Two successful examples will be presented that were developed independently by different companies. Hidden administrative pitfalls that often result in poor compliance will also be discussed. This tutorial will be highly interactive with live demonstrations, in-plant photographs, and compelling video clips. Students will be encouraged to ask questions and to participate in the discussions

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2017 EOS/ESD Association, Inc. Northeast Regional Tutorials

May 17-19, 2017

Teradyne Conference Center, 600 Riverpark Drive, North Reading, MA

May 19, 2017

8:30 AM - 12:00 PM

FC150: Hands-on ESD Measurements & Instruments Uses and Pitfalls

Ginger Hansel, Dangelmayer Associates LLC

Accurate data is the foundation of effective ESD program management. This hands-on tutorial will explain and demonstrate the proper use of ESD test equipment such as static locators, resistance meters, charge plate monitors, and event detectors. We will examine pitfalls of using these common instruments that can result in an incorrect representation of the ESD risk. For example, static locators can give misleading readings if the effects of voltage suppression are not taken into account. We will also discuss the effective use of ionization since ionizers that are not measured, maintained, and located correctly may contribute ESD hazards to the work area. Each student will participate in class exercises to perform these tests. The hands-on experience is the best way to understand the seriousness of the pitfalls and the benefits to taking the proper precautions. What you learn will help you avoid frequent auditing problems and improve your compliance verification program.

1:00 PM - 4:30 PM

ANSI/ESD S20.20-2014 Changes, Implications, and Test Methods

Ted Dangelmayer, Dangelmayer Associates LLC

The worldwide industry standard for static control programs, ANSI/ESD S20.20 undergoes review every 5 years. This time, the changes were numerous and the review process took almost 7 years. The current version was released in 2014. Companies who are certified to ANSI/ESD S20.20 - 2007 have until 2016 to comply with the 2014 version. The document changes, both editorial and technical, and their implications for users, will be discussed in this webinar. The changes will expand the use of some test methods or require new test methods and possibly new test equipment. These test methods as well as ANSI/ESD S20.20 capabilities will be discussed. Anyone involved with a static control program that is either compliant or certified to ANSI/ESD S20.20 will find important information in this webinar.

Please download and read ANSI/ESD S20.20 - 2014 prior to attending the tutorial.

Free download is available at <https://www.esda.org/standards/factory/esd-control-program/view/1544>

Topics that will be included:

1. Scope
2. Foreword
3. Tailoring Statement
 - a. Clarification: requirements vs. optional technical elements
4. Material Qualification Plan
5. Personnel grounding and Required walking test
6. Allowable Field Requirements
7. Ionization
8. Soldering irons
9. Packaging used as work surfaces
10. Requirements to Test Wrist Strap Connection Point

ANSI/ESD S20.20 New/Revised Test Methods

1. Walking Test Required
2. Measuring fields from small objects – electrostatic voltmeter
3. Measuring voltages on isolated conductors – High impedance contacting voltmeter
4. New Test Equipment That May be Necessary

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2017 EOS/ESD Association, Inc. Regional Tutorial

June 13-15, 2017

EOS/ESD Association, Inc., 7900 Turin Rd. Bldg. 3, Rome, NY 13440

June 13-14, 2017

8:00 a.m. - 5:00 p.m.

FC340: ESD Program Development & Assessment (ANSI/ESD S20.20 Seminar) Certification: PrM

Instructors David E. Swenson, Affinity Static Control Consulting, LLC; Kevin Duncan, Seagate Technology

The S20.20 Seminar is intended to bring all the aspects of the Program Manager Curriculum to a final focal point. The concepts of electrostatic control are discussed within the context of designing, implementing and maintaining an effective ESD control program plan that meets the requirements of the standard. Preparing a documented ESD Control Program Plan that can withstand a 3rd party ISO9000 Certification Body assessment is a major element of the certification process. Students are required to participate in numerous activities in this seminar to help acquaint them with the concepts involved in designing an ESD control program plan.

The following topics are covered in this course:

- Overview of ANSI/ESD S20.20
- How to approach an assessment
- Administrative elements
- ESD program assessment
- ESD program techniques for different applications
- Technical elements
- Overview of the assessment process
- The audit checklist and follow-up questions

June 15, 2017

8:00 a.m. - 5:00 p.m.

ESD Certified Professional Program Manager Exam

The Program Manager Certification program is intended for individuals who are involved in designing, implementing, managing, and auditing ESD control programs in their facilities.

The steps needed to achieve Program Manager Certification are:

1. Register for Certification Program.
2. Attend all of the 10 pre-requisite courses.
3. Pass an in-depth examination.

NOTE: You must initiate an official file in your name at EOS/ESD Association, Inc. headquarters, and complete all pre-requisite courses to be eligible to take the exam. **Exam fee applies**

For information visit: www.esda.org/certification/esda-professional-program-manager/

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2017 EOS/ESD Association, Inc. Regional Tutorials

December 4-5, 2017

EOS/ESD Association, Inc., 7900 Turin Rd. Bldg. 3, Rome, NY 13440

December 4, 2017

8:30 a.m. - 4:30 p.m.

FC170: ESD Training for Internal Auditors and Supplier Quality

Ron Gibson, Advanced Static Control Consulting; John T. Kinnear, IBM Corporation

This class has been designed specifically for those individuals who are responsible for:

- Performing internal company ESD assessments based on ANSI/ESD S20.20
- Conducting a pre-assessment of their facility prior to an external 3rd party assessment
- Assessing the ESD control programs of their suppliers

This course will use the checklist used by ESDA certified auditors as the basis for the class. However, this class will delve into the meaning behind each of the audit checklist questions in greater detail than is currently found in either the ESD Association registrar certification training or the ANSI/ESD S20.20 ESD program design seminar. After taking this class the student will be able assess a process and determine whether or not it meets the requirements of ANSI/ESD S20.20-2014.

Note: Familiarity with performing assessments is recommended for anyone planning on taking this course.

December 5, 2017

8:30 AM - 12:00 PM

FC164: Costly Controversial ESD Myths

Ted Dangelmayer, Dangelmayer Associates LLC

There are a number of common misunderstandings and controversies about electrostatic discharge (ESD) program management that can have significant impact on the implementation and maintenance of the ESD program. These misunderstandings or “myths” result in unnecessary expenditures and/or result in a compromise of the program integrity. These myths and controversies, such as latency are often cited by skeptics not wanting to adhere to certain standard ESD procedures. As a consequence, it is important to identify and dispel the myths as well as to understand the potential impact of latent failures.

This tutorial highlights 10 common myths and supporting success studies as well as a success study on latency. The myths and success studies presented here were chosen to provide real-world examples of how an ESD program can be strengthened by understanding the fallacy in each of the myths. This understanding will result in more reliable products that are also more cost competitive. Although not a myth, latency it is a significant reliability consideration that is surrounded with controversy. Some experts will argue that latency is virtually non-existent and others will claim that it is the dominant failure mode. Reality lies somewhere in between. The Latency study cites irrefutable evidence of latent failures in alarming proportions that must be factored into ESD programs and product design.

1:00 PM - 4:30 PM

FC161: Perfect ESD Storm

Ted Dangelmayer, Dangelmayer Associates LLC

Learn how to prepare for the “Perfect ESD Storm” that is brewing in the electronics industry. The trend towards extensive use of ultra-sensitive components (Class 0) and the widespread lack of CDM (Charged Device Model) understanding are brewing the “Perfect ESD Storm.” It is no longer business as usual, and it can take up to two years to prepare. This tutorial is intended for professionals who have a basic understanding of ESD but are not fully aware of CDM control techniques or the industry trend toward extremely sensitive devices and the counter measures that are necessary. Learn the answers to your questions as well as these examples. Are you skeptical about this news of a Class 0 trend? Is it really happening? Is it likely to be a problem in your factory? How big a problem is CDM in manufacturing? What is different about CDM controls? How do I tailor Ansi/ESD S20.20 for CDM and Class 0? Join us for this highly interactive tutorial and learn why this is inevitable and how to prepare for it.

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2017 EOS/ESD Association, Inc. Regional Tutorials

About the Instructors:

Ted Dangelmayer is the president of Dangelmayer Associates, LLC and has assembled an ESD consulting team consisting of the foremost authorities in virtually all ESD areas of both product design and manufacturing. He received the "Outstanding Contribution" award and the EOS/ESD Association "Founders" award. He was president of the EOS/ESD Association, chairman of the ESDA standards committee, and general chairman of the EOS/ESD Symposium. He has published two editions of his book, ESD Program Management, numerous magazine articles, and technical papers. Ted holds three patents and is iNARTE certified. He is currently president of the Northeast local chapter of the ESD Association and a member of the education committee.

Kevin Duncan is currently the corporate ESD program manager for Seagate Technology located in Bloomington, MN; where he has been actively involved in ESD at Seagate since 2005. He is responsible for controlling factory level ESD processes in the ultra-sensitive Slider, head gimbal assembly (HGA), head stack assembly (HSA), and drive manufacturing, and research and development locations. Kevin has been a member of the ESD Association since 2000 and is currently a member of the board of directors, education committee, standards committee, and technical program committee. He serves as the factory certification chair, computer based training chair, working group chairman for WG 3 – ionization, and participates in several other working groups. Kevin has also been presented with the Joel P. Weidendorf award for recognition of his significant contributions, service, leadership, and achievements in the field of EOS/ESD standards development. Kevin is a technical expert of the United States National Committee, where he represents the United States participating in International Electrotechnical Commission (IEC) Technical Committee 101 – Electrostatics. He currently serves as convener of maintenance teams 7 - Ionization and 9 - Flooring. He is an ESD certified professional program manager and an iNARTE certified ESD engineer.

Ron Gibson is the president of Advanced Static Control Consulting (ASCC), which was founded in 2010. ASCC provides consulting, ESD material and product qualification, and develops ESD training programs for clients. From 1994 to 2010 Ron was the corporate ESD program manager for Celestica International, Inc. and was responsible for the ESD control programs at all of Celestica's factories worldwide. From 1979 to 1994 Ron worked for IBM. Ron co-authored IBM's initial factory ESD standards. Ron has been a member of the ESD Association (ESDA) since 1988, and has served as an officer in the positions of president, senior vice president, vice president, secretary, and treasurer. He has also served as chairman of the ESDA Standards Committee (STDCOM) for over 10 years and as the first chairman of the ESDA certification business unit. Gibson is an iNARTE certified electrostatic discharge control engineer, an ESDA certified instructor for the program manager certification program, and is a certified chief ESD coordinator for the Reliability Center of Japan.

Ginger Hansel joined Motorola's Semiconductor Products Sector in 1981 as a Test Process/Equipment Engineer to analyze and improve manufacturing operations. She founded and led the manufacturing ESD control team that trained, audited, qualified materials, and established innovative solutions throughout the semiconductor sector. Under her leadership, the team reduced a 40% failure rate in one test operation to almost zero through the targeted introduction of specific ESD control materials and ESD Awareness training. Ginger brought ESD awareness to her other roles as Engineering Section Leader, Technical Training Manager, QA Engineer, Business Metrics Engineer, Data and Document Control Manager, Program Manager and Technical Product Marketing Manager. Ginger retired from Motorola/Freescale in 2004 and became Director of Marketing and Program Management with the ESD consulting group, Dangelmayer Associates. She has published numerous magazine articles and technical papers on effective ESD control programs and awareness training; examples include "The Production Operator: Weak Link or Warrior in the ESD Battle" and "Cost Effective Failure Analysis Method for Detecting Failure Site Associated with Extremely Small Leakage". She has taught seminars, workshops and webinars around the country and abroad. For over 35 years, Ginger has held leadership positions in the EOS/ESD Association such as President, Board of Directors, Chair of the Education Business Unit and has served on the Steering, Technical Program, Standards, and other committees. She is currently the Senior Vice President of the Association and Chair of the Services Business Unit Group. Ginger initiated the NARTE ESD Certification in 1992 and is a certified ESD Control Engineer. She is currently on the Board of Directors for the Texas ESD Association. Ms. Hansel received a BS in Natural Sciences (Psychology) and a BS in Electrical Engineering Technology, both from the University of Houston. She received her MBA (Executive Option II program) from the University of Texas.

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2017 EOS/ESD Association, Inc. Regional Tutorials

About the Instructors: Continued

John Kinnear is an IBM senior engineer specializing in process & system technology, and facility certification in accordance with ANSI/ESD S20.20. He has a BS degree from University of Buffalo and a MS degree from Syracuse University. John is well known globally for his technical contributions to national and international standards. He has been the IBM ESD site coordinator for the Poughkeepsie site since 1989. He is past chairman of the IBM inter-divisional technical liaison committee for ESD protection and is an important member of his company's committee to develop and implement the ESD corporate program for IBM. John has coordinated the testing of large mainframes for compliance to EMC, safety, environmental, shipping, and volatile organic emission standards. He has also been the lead engineer on testing large mainframe systems to EMC emissions and immunity standards for FCC, CE Mark, VCCI, and other national requirements. As a member of the ESD Association since 1990, John has served in several standards development committees as well as association management positions. John is the appointed technical adviser to the United States National Committee/IEC technical committee 101, where he represents the United States to the International Electrotechnical Commission (IEC). In this position he assisted in the evolution of international ESD standards and supports international adoption of ANSI/ESD S20.20. As chair of the ESDA's facility certification (ANSI/ESD S20.20) development program, John played major roles in the program's development and industry launch. In particular, John coordinated the initial development of lead assessor training, ISO registrar certification, and witness audits. John has served in every ESD Association officer's position, including vice president, senior vice president, and president. He is the past chairman of the EOS/ESD Symposium technical program committee and past general chairman of the 2004 EOS/ESD Symposium. For his contributions to the ESD Association, John was presented with the Outstanding Contribution award in September 2006.

Jay Skolnik PE, CPI, CPM, a Licensed Professional Electrical Engineer, is the co-founder and Lead Engineer / Consultant of Skolnik Technical Training in Albuquerque, NM. With over thirty years of experience in the electronics industry, Jay has developed a multitude of products utilized in different industries, including military, defense, avionics, aerospace, commercial, industrial, medical, automotive, and sports entertainment. As an ESDA Certified Program Manager, Jay teaches ESD mitigation and control for the electronics & energetics specialties. He performs ESD audits to ensure factories and laboratories are following safe ESD control guidelines and procedures. He is also certified by iNARTE and is a Certified Professional Instructor of National Instruments (NI). He received his Electrical Engineering degree from the University of Missouri-Rolla.

David E. Swenson retired in 2003 after 35 years of service from 3M. While at 3M he had responsibility for new packaging material development and application, training of 3M personnel worldwide and providing application assistance to users of static control products globally with particular emphasis on Asia Pacific and Japan. Dave and his wife Geri established a new company, Affinity Static Control Consulting, L.L.C. in 2003. Dave has been a member of the ESD Association since 1984 and has served in many capacities including 1997 Symposium General Chair and president of the Association in 1998 and 1999 and again in 2008 and 2009. He was re-elected to the Board of Directors for a 5th term from 2014 to 2016. Dave was presented with the highest award of the ESD Association, the "Outstanding Contributions Award" in 2002, the Standards Committee "Joel P. Weidendorf Memorial Award" in 2004 and the Association "Edward G. Weggeland" Memorial Award in 2014. He is a member of the Standards Committee and the ANSI/ESD S20.20 Standard Task Team and is chairman of the Packaging and Grounding working groups. Dave also serves as Treasurer and Information Liaison of the Texas Chapter of the ESD Association; he is a member of the Electrostatic Society of America, the UK Institute of Physics and is a US Expert to IEC TC101, Electrostatics. In addition, he is the convener of Joint Working Group 13 between TC101 and TC40 (Electrostatics and Capacitors and Resistors). He can be reached at 512-244-7514 and at static2@swbell.net.

Dr. Terry L. Welscher retired from Lucent Technologies-Bell Laboratories Engineering Research Center in 2001, as the director of the quality, test, & reliability department. He began his career in Bell Labs in 1978; where he worked on electrical conduction mechanisms in insulating polymers and electrolytic corrosion failure mechanisms in electrical interconnection materials. In 1984, he was appointed distinguished member of technical staff for his work in these fields. In 1986, he was promoted to technical manager to re-constitute the Bell Laboratories core expertise in electrostatic discharge (ESD). The newly formed group proceeded to produce a string of ground-breaking contributions to the field and played a key role in advancing industry standards. In 1994, he broadened his group's activities to all aspects of hardware reliability for Lucent Technologies with special emphasis in environmental stress testing (EST) and product reliability prediction and planning. In 1997, he was promoted to director of the quality, test & reliability center of excellence where he directed the development and deployment of product quality, test and reliability assurance practices for Lucent Technologies business units. This work included design for testability of integrated circuits, board and system level test and diagnosis and special techniques for testing of RF and optoelectronic systems and components. After leaving Lucent, he became reliability director for LaserSharp Corporation, an optical fiber laser amplifier company, where he was responsible for product quality, reliability, and compliance. Since 2004, he has been senior vice president of Dangelmayr Associates, LLC, an EOS/ESD consulting firm. Dr. Welscher was chairman of the ESD Association standards committee 1988-1989. He was technical program chair in 1991, vice general chair in 1992, and general chair in 1993 of the EOS/ESD Symposium. He served as member of the Symposium board of directors 1993-1995. He has also been active in quality standards and road mapping activities with Sematech, the EOS/ESD Association, and the JEDEC 14 quality and reliability committee. He served on the board of directors of JEDEC 1999-2001. He is currently co-chair of the joint JEDEC/ESDA HBM and CDM ESD working groups, and member of the Board of Directors and Past President of the EOS/ESD Association. Recently, he has led the effort to harmonize and merge JEDEC and ESDA device testing standards. He holds a BS in chemistry from Florida State University and a PhD in chemical physics from the University of Texas at Austin. He is author or co-author of fifty papers in solid state physics, applied mathematics, organic chemistry, electronics reliability, and electrostatic discharge. For his contributions to the ESD Association, Terry was presented with the Outstanding Contribution award in September 2016.

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TEXAS

March 7	\$710
March 8	\$710

March 7-8, 2017

Texas Regional Tutorial Program 3M Innovation Center, Austin, TX 78726

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May 17	\$710
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May 17-19, 2017

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NEW YORK

June 13-14	\$1,710
June 15	\$ 60*

June 13-14, 2017

Regional Tutorial Program EOS/ESD Association, Inc., Rome, NY 13440

June 13-14 ESD Program Development & Assessment (ANSI/ESD S20.20 Seminar)

June 15 ESD Certified Professional Program Manager Exam

*NOTE: You must be registered in the ESD Professional Program Manager program and complete all pre-requisite courses to be eligible to take the exam.

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