Volume 13, No 2

PRODUCT SAFETY ENGINEERING NEWSLETTER

What's Inside

Editor's Message

Dear Readers,

2017 has been an exciting year! Not only ISPCE 2017 is being held at the Capital of Silicon Valley, San Jose, CA, but the second ISPCE-TW is going to be held at National Taiwan Normal University in Taipei, Taiwan, at the end of this year. I look forward to meeting you all in these two great events!

In this issue you will find our President's Message, the News about Chapters with their exciting activities in various cities, the Senior Member News as usual, and the introduction of our new members of the Board of Governors. In addition, unfortunately, we got an obituary for Jack Burns, as one of the important founders of IEEE PSES, his contribution will be appreciated forever. Also, in the legal column, an inspiring issue of the overview of the new German occupational health and safety legislation is provided by Dr. Carsten Schucht. Lastly, two technical papers with regard to TOUCH CURRENT measurement and the Use of Li-On Battery Technology are presented by Peter E Perkins and Edward Jones, respectively.

Still, to support this Newsletter as a platform for sharing knowledge and communicating with the professionals, it is encouraged to offer any kinds of dedication, cooperation, and precious comments. Let's work together to make this the best Newsletter ever. As a result, any contributions of articles with a variety of topics that are of interest to our readers are welcomed. We believe 2017 would be a prosperous year with remarkable growth for both PSES and the Newsletter!

Please feel free to communicate with me at any time.

Wen-Chung Kao
jungkao@ntnu.edu.tw

Newsletter Committee

The Product Safety Engineering Newsletter is published quarterly during the last month of each calendar quarter. Closing dates for articles, news items, and advertising:

1Q issue: February 15
2Q issue: May 15
3Q issue: August 15
4Q issue: November 15

Volume 13, No. 2 - May 2017

The Product Safety Engineering Newsletter is published by the IEEE Product Safety Engineering Society.

President's Message

Hello,

Welcome and I'm glad to see everyone here at ISPCE 2017. I hope everyone is enjoying the great Technical Program the team has put together along with being able to get out and about in beautiful San Jose, CA.

Your Board has been busy making this the best Society ever. We had our Executive Committee dinner meeting on Saturday and our all day Board of Governors meeting on Sunday. We're seeing a lot of opportunities to bring more value to you and add to our membership. Myself, and all the VPs are hard at work and you'll see in their summaries throughout the newsletter.

We are looking to work with other Societies in bringing our knowledge and expertise to each. In fact, we're just about to sign a Sister Society MOU with the EMC Society who has been a large part of first helping us to become a Society and now partnering on joint Chapter meetings, conferences and more collaboration.

I'll be presenting Compliance 101 to the Instrumentation and Measurement Technology Society's I2MTC Conference in Torino, Italy in a few weeks. We hope this relationship continues to grow with more collaboration.

We're in discussions with several others as well. And hope to bring Compliance 101 on the road to teach others the basics and help them get their hands around the seeming quagmire of safety and compliance.

We're also reaching outside the IEEE to other organizations like the PSMA – Power Sources Manufacturers Association who is here at ISPCE. Please stop by their booth to see what they have to offer. And for the first time ever, we are getting the Division VI Societies and Councils to collaborate. Our first collaboration will be at Sections Congress, where we'll share a couple of tables to present our Societies to others.

Other areas of activity are the Education and Entrepreneurial Activities along with finding ways to work with the Young Professionals. To stay on top of everything going on be sure to check the calendar on our website.

We do need your help and you should've all seen the Call for Nominations by now. If you are energetic and like to get things done, consider joining the Board of Governors in making this the best Society ever.

We look forward to continuing our work together in educating and keeping our members at the forefront of safety and compliance issues and constant changes.

Sincerely,

John Allen
President

Chapter News

By Murlin Marks,
Life Senior IEEE, Past President PSES

PSES Chapters at ISPCE2017

Our annual ISPCE is the main opportunity for our chapter leaders to get together, share stories and plan with colleagues. This Newsletter issue is timed for the event. In the next issue, we'll have photos and news from the conference. Everyone should have received the Conference Newsletters that were issued the month or so prior to the conference.

At the ISPCE, the Chapter of the Year for the previous year is announced. The winner for 2016 is the Madras, India Chapter, headed by Dr. V. Jayaprakasan. As you can see from the report below, they have a great program!

Also at the ISPCE, we have our Chapter Annual Meeting where chapter leaders can meet and share ideas for better local programs. We will report on this in the September Newsletter.

Chapter Activities

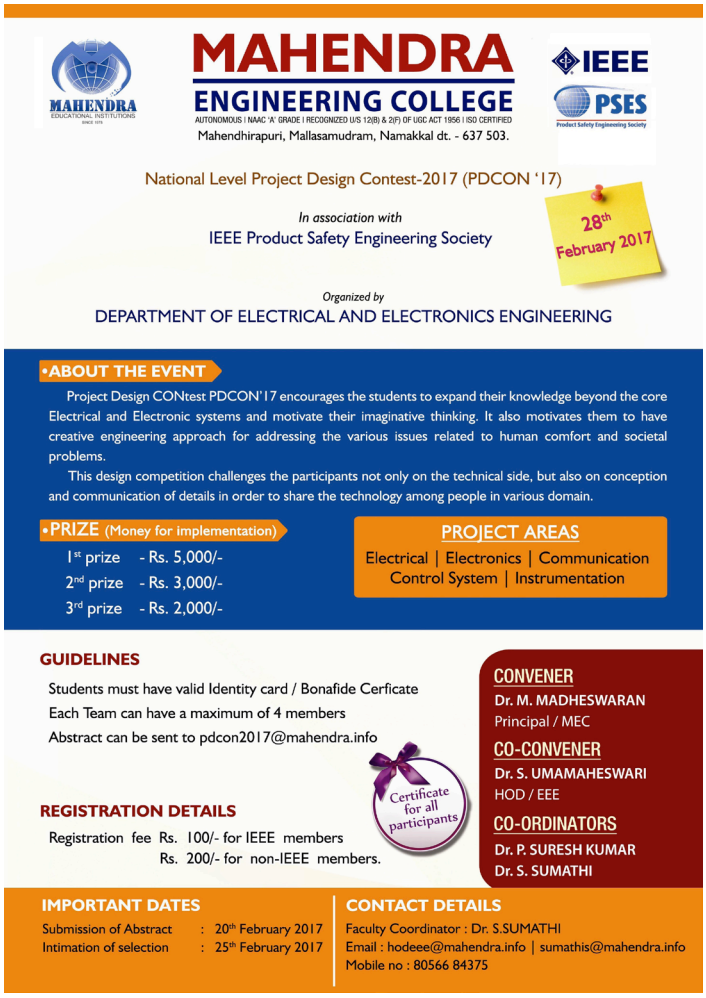
Madras, India

Dr. V. Jayaprakasan reports that The Department of EEE, Mahendra Engineering College (Autonomous), Mallasamudram, Namakkal in association with IEEE Product Safety Engineering Society - Madras Chapter organized a Project Design Contest"PDCON-2017" at the Circuits and Devices Lab of EEE Department on 28th February 2017.

The External Resource Persons Dr.S.Vijayakumar, Secretary, IEEE PSES–Madras Chapter and Mrs.J.Hareni, Centre Head, Live Wire along with the internal resource person Prof. Andrews, Additional Director juried the Projects which were innovatively designed and exhibited by student batches came from various colleges nationally.

Dr.S.Vijayakumar, Secretary, IEEE – Product Safety Engineering Society, Madras Chapter has given a Key note talk on "Renewable Energy Sources for Ecological Safety" during the afternoon session. He delivered information about the traditional energy sources and the importance of renewable energy sources. He motivated the gathering to utilize the alternate energy sources for an eco-friendly earth.

During the valedictory function, Dr.Umamaheswari, Co-convener and Head of EEE Department welcomed the gathering. Dr.M.Madheswaran, Principal has given the valedictory address. The Chief Guests along with the Principal distributed certificates. Prizes were given to the best projects. Dr.S.Sumathi, Prof./EEE Coordinated the contest in a pleasant manner. Dr.P.Sureshkumar, Prof./EEE, delivered the vote of thanks. Over thirty groups from various institutions, on various concepts participated in the contest.



Chicago Chapter

Harry Jones reports on the Chicago February meeting

The Chicago Chapter, hosted by UL – Northbrook, received a presentation at its February 22, 2017 meeting covering a "Look Back at Some of the History and People Behind our Product Safety Requirements" given by Dave Dini. Dave is an IEEE Life Senior Member who retired in 2016 after 42 years with UL. Most of Dave's career was as a research engineer with special interests including technology for electrical safety in the home and in the workplace. He is currently chair of the NFPA 70E technical committee for electrical safety in the workplace. He is also a PSES Charter Member, and UL Corporate Fellow with the William Henry Merrill Society.

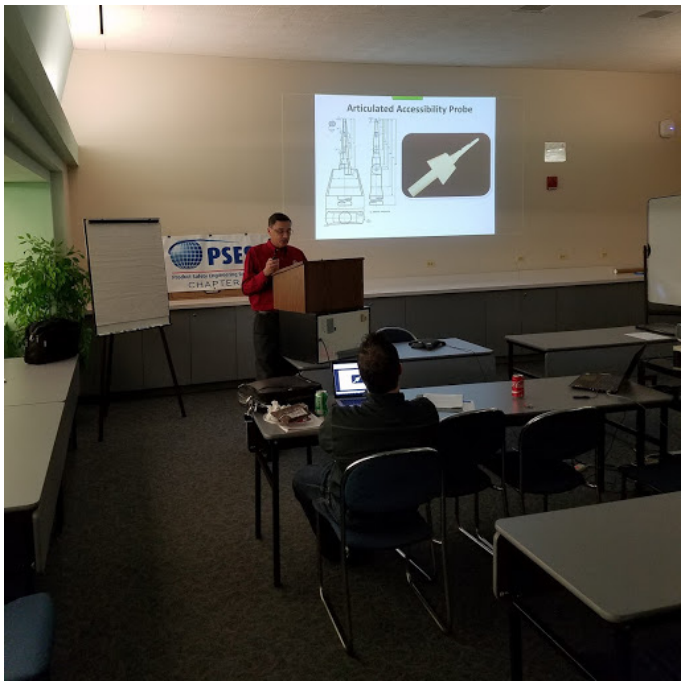
Just prior to retirement in 2016, Dave was tasked with organizing, compiling, and digitally storing much of UL's historical and archived information from research projects going back almost 100 years. This program included a collection of some old as well as newer historical photographs, data, and stories about people and projects that led to the requirements for many of the standards and test devices that we still use today. GFCIs, the articulated probe, electric fence controllers, and leakage current requirements, to name a few, were highlighted with pictures and stories, some of which have been undiscovered and untold for decades. This presentation provided an invaluable example of how to use history to educate and motivate young engineers new to the field of product safety and compliance.

Back in the 1930's, UL conducted field testing of electric fence controllers designed to contain farm animals through electric shock. The result was a list of unique new safety requirements to allow farm animal control without becoming lethal to animals, farm workers, and most importantly young children living in rural areas who may not know that the fence was electrified. One of the interesting findings was the establishment of a maximum available level of current that represents the hazardous shock potential from the electrified fence. Baron Whitaker, the UL engineer at the time who later became UL's 6th president, determined that a maximum safe level of available current from the fence controller would need to be only 5 milliamperes to protect even a 2 year old child. It is interesting to note that this same 5 ma level was derived in later studies for different reasons and still used today as the threshold limit chosen for ground fault circuit interrupters (GFCI).

Early household electric fans were found to be a source of injury to hands due to the size of openings in the fan blade guard. Using volunteer test subjects from the 1970s, UL conducted studies of dimensions of fingers and larger sections of hands for various age brackets of children, men and women, and then developed an articulated probe that was used to determine the maximum size of openings in appliances that may provide contact to both mechanical and electrical hazardous parts. Around that same time experiments were conducted again using volunteer test subjects to determine their reaction to leakage currents. This work was done to help determine what level of current would be necessary to cause an involuntary reaction of sufficient magnitude to cause an unwanted incident. Today we still use the 0.5 mA level for appliance leakage currents that was determined from these experiments.

Although testing and certification to electrical safety standards has been occurring for well over 100 years,

few people actually realize the efforts of countless scientists and engineers involved in the research and development of the requirements for these products. We must also not forget those volunteers, both young and old, who gave their own time to generate the data needed to make our work accurate and relevant. Thomas Edison once said, “There’s a way to do it better… find it.” As we strive to encourage more young people to enter the field of product safety engineering, we must keep alive our stories from the past and the people and their projects that helped to create the standards for the science of safety as we know it today. To this end, our safety professionals of the future will undoubtedly find ways to make our standards and the requirements they contain even better.



Orange County, California

Homi Ahmadi reports that at the Orange County California February meeting the speaker was Mr Jeff Wurzback, founder of Wurzback Electronics which is a consulting firm specializing in drone design, testing and certification. The topic was “Product Compliance Considerations for Mass Market Drones “.

San Diego

Bansi Patel reports that PSES has monthly meetings on the second Tuesday of each month. The meeting is held at one of three locations: The HPE facility in Rancho Bernardo, CA; Nemko USA, Inc. in Carlsbad or ATEC (Advanced Test Equipment Corp in San Diego.

The March meeting was held on March 14, 2017 at Nemko USA, Inc office in Carlsbad. The presentation was

a discussion of Amendment 1 to IEC 61010 3rd Ed., the importance of Risk Analyses in 61010 products and discussion of some 61010 part 2 Standards. The presenter was Jung Ju Kim (JJ) of Nemko USA.; JJ has over 16 years of Product Compliance experience. He worked as a safety technical manager in Nemko Korea from 2000 to 2013 and his experience is in IT and office equipment, Luminaries, Measurement, Control and Laboratory equipment and Medical products. JJ transferred from Nemko Korea to Nemko San Diego (Carlsbad office) in 2013 where he currently works as a Senior Safety Engineer.

A certificate of appreciation was given to JJ Kim by Vice Chair Bansi Patel. Photo is attached.

Santa Clara Valley

At February's meeting, Ken Kapur gave an overview of the growing concern worldwide about end of life of electronics and the use of specialized chemicals and materials. Regulations continue to expand the management of end of life, restrictions on materials and chemicals in electronics, and limitations on the use of energy.

Following Ken, Pamela Gordon discussed the activities of Antea Group in the development and application of sustainable and integral solutions relating to the environment.

Then Steve Gendel of Thermo Scientific demonstrated his company's Niton analyzer, a hand-held x-ray device to check internal temperatures of products and components.

Thanks to all the chapters who sent in reports. I think everyone will agree that it's nice to hear what's going on in different areas and to see photos of our colleagues. I'd also encourage everyone to put complete information about presentations and activities on their respective websites.

Remember to check out chapter meeting schedules when you travel!

News about Technical Activity Committees

By Silvia Díaz Monnier,
VP of Technical Activities,
IEEE PSES

We currently have four Technical Activities Committees: Forensic & Failure Analysis; Telecom Safety; Information Technology and Risk Analysis.

To see current Technical Activity Committee information please go to the Technical Activities page at:
http://ewh.ieee.org/soc/pses/technical.html

Some topics on which there is interest to start Technical Committees are:
-Medical Product Safety
-Education
-Industrial Equipments and Controls

If you are interesting in taking part of a technical committee or looking to start a new one, please contact me (Silvia Díaz Monnier) at silviadm@inti.gob.ar.

The more people who participate the more we can accomplish as professionals and as a society. Spread the word - invite others to join PSES technical activities!

Technical Activities General Meeting and Technical Committees annual meetings

The Technical Activities General Meeting is set for Tuesday at 7pm at ISPCE 2017. If you are interested in supporting PSES technical activities, please come. The more people who participate the more we can accomplish as professionals and as a society.

On Wednesday, we will have our first Technical Committee Luncheon. We currently have four TCs: Forensic & Failure Analysis (Daren Slee, Chair); Telecom Safety (Don Gies); IT (Gary Schrempp) and Risk Analysis (open). Each TC will have a reserved table. There will be a sign-up near the PSES booth at Symposium. Sign up early! Space will be limited to ten at each table.

If you are interested in becoming involved in any technical issue, let me know, and we can discuss how you might get involved. I will be attending ISPCE 2017and I will be available to talk about this, or you can contact me at silviadm@inti.gob.ar. Take advantage of this great opportunity for your professional growth!

Telecom Safety Technical Committee

The Telecom Safety TC meets via conference call monthly.
For information about the TSTC contact Don Gies at don.gies@nokia-bell-labs.com. Meetings are generally held on the second Wednesday of the month.

Information Technology Technical Committee

The IEEE PSES Technical Committee for Audio/Video, Information and Communication Technology Equipment continues to meet regularly via teleconference on the 3rd Monday of each month. Our 21 members discuss technical issues related to the implementation of the new standard for safety for Information Technology Equipment, IEC 62368-1. Recent topics included enclosure requirements, EU timelines for adoption, China adoption, and USB power considerations.

For information about the ITTC contact Gary Schrempp at Gary_schrempp@dell.com.

In Memoriam – Jack Burns

By Murlin Marks,
Life Senior IEEE,
Past President PSES

It is with great sadness that we note the passing of Jack Burns, a PSES founder. Jack was instrumental in the creation of PSES.

I first met Jack at a TC-8 Annual Meeting at the EMCS Symposium in Dallas. There was one person in the audience. When we were done with our pitch for Product Safety, Jack spoke up in his cheerful Texan accent: "How can I help?" Over a period of several years, Jack picked up the lead in our efforts to form an IEEE Product Safety Engineering Society. On the PSES Board of Directors, Jack lead efforts to build our technical program and became our first VP of Technical Activities. He will be missed.

Photo: Jack (left) at the 2003 EMC Symposium in Boston.

Senior Member News

By Mariel Acosta,
VP of Member Services,
IEEE PSES

In 2016, the number of newly elevated IEEE PSES senior members went up to 20, from 11 in 2015, that is a 45% increase! Congratulations to our newly elevated IEEE seniors! For anybody contemplating the idea of elevating their status, see if you recognize anyone in the list who has worked with you. One of your sponsors may be a new senior member!

Daren Slee
Mariel Acosta-Geraldino
V Jayaprakasan
Harry Jones
Fabio Furlan
Julio Posse
Lei Wang
Frank Dominguez
John Allen
Roderick Muttram
Paul Robinson
Richard Stern
George White
Azim Karimi
William Bush
Robert Griffin- Spotlight
Jeff Pasternak- Spotlight
Scott Raszeja
Allan Saadus- Spotlight
Peter Walsh

IEEE PSES member spotlight- Meet your IEEE PSES colleagues!

As part of a new initiative, we will be highlighting some of our colleagues in IEEE PSES. On this installment you will find 3 of our newer IEEE PSES senior members.

Mr. Bob Griffin, Director and Sr Technical Staff Member, Corporate Product Safety and Hardware Compliance, IBM Corporation, Raleigh, North Carolina

Robert (Bob) Griffin manages IBM's global Corporate Product Safety and Hardware Compliance mission with responsibility for direction of policy, standards, certification and compliance activities in the fields of product safety, electromagnetic compatibility, and radio/telecommunications for all business units and geographies. He has worked in the ICT hardware compliance fields for 30 years and serves as the subject matter expert for IBM's product safety and conformity assessment community.

External to IBM, he serves on many standards development and conformity assessment organizations, both within the US and internationally. Bob is the US Technical Advisor to the IEC for the ICT products industry where he has served as a US expert to IEC TC74 and TC108 for more than 15 years. He is presently the Chairman of IEC TC108 and Convener of IEC TC108's HBSDT working group charged with developing future ICT safety standards.

Bob has presented at numerous seminars and symposia on a variety of topics including Hazard-based engineering, positive regulatory practices, the IEC's hazard-based standard, IEC62368-1 and the interplay of standards, conformity assessment and regulation.

Jeffrey J. Pasternak, Product Regulatory Business Strategist. Data Center Group, Intel Corporation. Phoenix, Arizona.

Jeff has more than 30 years of experience in Product Regulations and Certifications. His career started with Canadian Standards Association in Vancouver, Canada. He eventually moved to the United States where he initially managed a couple of safety labs, before taking on the role as the Lead Senior Regulatory Compliance Engineer for Calcomp (a Subsidiary of Lockheed Martin).

Jeff is now in his 20th year at Intel, where for 16 of those years he managed the ship for Intel's Enterprise Platform & Server Division with regards to worldwide regulatory compliance and strategies with focus in areas of Product Safety, EMC and Product Ecology. Currently, Jeff supports Intel's Data Center Group as their Product Regulatory Business Strategist covering the entire data center ecosystem. He continues to be actively involved in industry forum groups such as ITI Technical Committee (TC2), TC108 US Technical Advisory Group and the IEC Hazard Base Safety Development Team working with the new Hazard Base Safety Standard IEC62368.

Allan Saadus, Manager, Corporate Product Safety. Consumer Service Engineering, Sony Electronics Inc. San Diego California.

Allan has over thirty years of direct experience in the field of engineering, including the design, manufacture, assembly, test, and failure analysis of consumer and military electronic products and their components. Over seven years of direct experience in product safety, product liability, fire scene, and fire artifact evidence examination related to fire origin and cause analysis for consumer electronic product claims.

Allan has a Bachelors in electronic engineering, and a Masters of business administration. He has completed 12 ironman triathlons and 2 Boston marathons. He is married with 4 kids, ages 11-25.

Wondering how to take the next step to elevate your status to Senior?

If you want to start the membership elevation process to senior member grade, you will need:

-IEEE member grade level. (Affiliate and associate are not IEEE members and are not eligible for membership elevation to Senior IEEE members)

-10 years working on IEEE designated field AND at least 5 years of significant experience.

-3 references of IEEE senior members. You will need their IEEE numbers. I recommend you have an updated resume at hand, so you can send it to your references so they can write better recommendations.

-Log on to your IEEE account and start the process.

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- Chapter activity reports

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Meet the Board

By Mike Nicholls, VP of Communications Services, IEEE PSES

Meet the PSES Board of Governors
This issue we will meet the 4 new Board of Governor members at large who started their 3 year term effective January 1 2017.

Don Gies

Current IEEE Position:
Chairman, PSES Telecom Safety Technical Committee
Member PSES Board of Governors at Large

Current Employment:
Nokia-Bell Labs
Education:
BSEE – Rutgers University-1986

Technical and Professional Experience:

- Product compliance engineer for over 30 years.
- Senior product compliance engineer at Nokia-Bell Labs (AT&T/Lucent Technologies/Alcatel-Lucent), Global Product Compliance Laboratory, Murray Hill, NJ since 1989.
- Responsible for global product safety certifications for ICT equipment.
- Expert on the National Electrical Code and wiring rules used around the world, telecom safety, safety of outdoor-installed equipment, and safety of equipment containing batteries.
- Member of the ANSI/US Technical Advisory Group to IEC Technical Committee TC108, as well as a member of TC108 working groups.
- Member of Telcordia Technical Forums.
- Elected to Alcatel-Lucent Technical Academy in 2009.
- Is an adjunct professor at New Jersey Institute of Technology (NJIT), Newark, NJ, teaching graduate-level power engineering courses since 2013.
- Prior to working at Nokia-Bell Labs, was TEMPEST engineer at Honeywell-Signal Analysis Center.

IEEE/PSES Activities:
COMMITTEE/BOARD
Chairman, PSES Telecom Safety Technical Committee (TSTC) - 2011- present – Leads the Telecom Safety Technical Committee with monthly 1 ½ hour teleconferences.

The outputs of the meetings are posted in minutes, which in turn are used to contribute to the PSES quarterly newsletter.

IEEE/PSES Accomplishments and Recognitions/Awards:
IEEE Senior Member - 2013
Being a member of an organization such as Bell Labs for so long has exposed me to resources and experience that few get to encounter in their professional lifetimes. I have the IEEE Product Safety Engineering Society to thank for providing the avenue to put the unique experiences and technical knowledge into papers and presentations to share with the rest of my fellow compliance engineers. It is through re-presenting my papers that I was chosen to be an adjunct professor at NJIT.

So, since I have been provided with so many opportunities in the IEEE PSES, I wish to give back more by being a member of the Board of Directors.

Fabio Furlan

Current IEEE Position:
Member PSES Board of Governors at Large
Current Employment:
CSA Group

Education:
Master of Business Administration – University of Phoenix
Bachelor of Science Degree in Business – Management – University of Phoenix
Applied Science Degree in Electronics Engineering Technology – British Columbia Institute of Technology

Technical and Professional Experience:
• Operations Manager for CSA Group's Irvine California Laboratory.
• Employed with CSA both in Canada & the US for more than 25 years and has held various positions including Project Engineer, Team Leader, Project Manager, Product Group Manager and Operations Manager.
• Field of product compliance area of expertise covers the product areas of Information Technology, Telecom, Power Supplies, Transformers, Laboratory, Test and Measurement, and Audio/Video. Currently,
• Responsible all operational aspects for Irvine laboratory. In addition, he is responsible for the CSA Mexico City field service team. He is a member of the CSA Group Senior Leadership Team reporting to the Vice President, U.S. and Mexico Region.

IEEE/PSES Activities:
Certificate of Recognitions for presenting at Orange County and San Diego chapter meetings.
Presented at both the San Diego and Orange County chapters. Supported the Orange County chapter by hosting some monthly chapter meetings at CSA Irvine.

IEEE/PSES Accomplishments and Recognitions/Awards:
I am grateful for the opportunity to be nominated for the chance to participate on the PSES Board of Directors. Not only is this a great opportunity for my personal development but more importantly this is a great opportunity for CSA Group to be represented at the PSES. I believe I can influence CSA Group to provide greater commitment to PSES activities. In addition, having a more substantial relationship with a certification body like CSA Group will further enhance the exposure of the IEEE Product Safety Engineering Society. CSA Group is committed to my participation on the BoD by providing financial support to actively participate in the Board meetings and contribute to its activities. Lastly, with my 28 years of product safety experience I will be a valuable asset to the PSES and provide new ideas to help keep the PSES relevant for years to come.

Jeff Pasternak

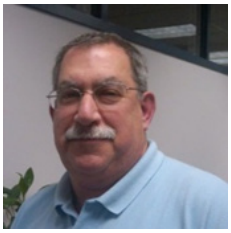
Current IEEE Position:
Member PSES Board of Governors at Large
Current Employment:
Intel Corporation

Education:
Graduated from Vancouver Community College (Canada) in Electronic Technician & Advanced Electronics

Technical and Professional Experience:
• Employed with Intel (19 years 1997-2016) as a Product Regulatory Business Strategist for Intel's most profitable business group (Data Center Group).
• In 1992 he moved from Canada to USA in 1992 and managed a couple of safety test labs.
• From 1995-1997 became the Senior Product Safety Manager at Calcomp (Lockheed Martin Subsidiary).
• Safety career started at CSA (1985-89 - Vancouver, Canada) as a senior certification engineer. Over the years has participated in several industry committees and in pioneer days he met with many regulators (China, Taiwan, Korea, Argentina, etc.) in helping pave and resolve regulatory challenges.
• Invited / honored twice as key note speaker at Taiwan's largest electronic trade show (Taitronics)

IEEE/PSES Activities:
Active Member of IEEE PSES

IEEE/PSES Accomplishments and Recognitions/Awards:
Throughout my product regulations / safety career I have thoroughly enjoyed working with various teams, industry colleagues, regulators, standard committees, etc. in enhancing product safety compliance needs to support industry and its business needs. With my broad experience and working in the various areas of the products safety business (certifier, consultant / test lab and manufacturing) I believe I can be a valuable contributor as a BoD member. I certainly look forward to this opportunity as being able to give back to the safety society and regulatory world is very gratifying, and can be helpful with respect to my personal career development. My employer (Intel) is committed to my participation in the society and with my 31 years of experience in the field of product safety, I see this as a perfect fit for my skill-set and look forward to the opportunity in providing valuable input.



Steve Brody
Current IEEE Position:
Chapter Chair
Member PSES Board of Governors at Large
Current Employment:
Retired Consultant

Education:
Associate Degree in Electrical Engineering Technology from Lowell Technological Institute and is completing a BS Degree in Technical Management from Southern New Hampshire University.

Technical and Professional Experience:
• Currently Owner/Manager of Product EHS Consulting LLC; a firm specializing in providing out-source global regulatory and compliance solutions for manufacturers.
• Managed and worked in Product Safety, Compliance, Regulatory Engineering, and Standards development for over 40 years for Modicon, Wang Laboratories, Symbol Technologies, Thermo Fisher Scientific, and Brooks Automation, before starting Product EHS Consulting LLC, now a UL Certificated Agency.
• A member of UL's STP for 61010-1, active member on SEMI EHS Committee, and served on CSA Standards Committees.
• Currently President of the Northeast Product Safety Society, and Chair of the Boston Chapter of the IEEE PSES.

IEEE/PSES Activities:
ISPCE Committees (2010, 2016)

IEEE/PSES Accomplishments and Recognitions/Awards:
I have been an active member of the PSES for many years, and before that I was part of the Northeast Product Safety Society, which was in existence long before the PSES. My involvement in Compliance work always involved not just directing but educating my clients both internal and external on why something was incorrect and what changes were needed. This included presentations at PSES, at SEMI, and at a NIST/China Conformity Assessment Symposium. I believe that this is a crucial function for PSES and that our role needs to expand to Engineering schools to provide an awareness of standards, compliance, and product safety. This is something that I will try to develop as part of the Society's mission and work program. Thank you for the opportunity to serve you.

Legal Column

Dr. Carsten Schucht, Lawyer (Rechtsanwalt)

Electrical devices as work equipment – an overview of the new German occupational health and safety legislation

First of all, the Ordinance on Industrial Health and Safety was reformed in 2015 and came into effect on 1 June of that year. Then, at the end of 2016, the German Workplace Ordinance also entered into force. Both ordinances are based on the German Labour Protection Act. Their role is therefore to define labour protection laws in specific areas such as work equipment and workplaces. It should be noted that German labour protection law also includes other statutes such as the Ordinance on Hazardous Substances.

Where the Ordinance on Industrial Health and Safety is concerned, the scope is closely connected with working materials such as tools, equipment, machinery and installations. Hence, these rules are important for every company which has employees since working without working materials is of course simply impossible. In contrast, the Workplace Ordinance deals with workplaces. Its provisions specifically regulate the installation and operation of workplaces as well. Against this background, the importance of this ordinance is not to be underestimated. Thus the relevance of this regulation was the reason for heated discussions between occupational safety experts on the one side and the employer's association on the other when this ordinance was being reformed. The employers were especially afraid of too much bureaucracy, and therefore sought to pursue their interests carefully. In the end, however, both sides were able to reach a compromise. Hence another modern ordinance on occupational safety has been established in Germany.

Ordinance on Industrial Health and Safety

The Ordinance on Industrial Health and Safety primarily serves to transpose Directive 2009/104/EC concerning the minimum safety and health requirements for the use of work equipment by workers at work into German law. Therefore, it should be borne in mind that similar provisions are set down in all 28 Member States of the European Union (still including the UK). However, the German ordinance not only applies to work equipment; it also regulates facilities subject to inspection such as lifts or pressure systems. In this regard, there is no role model in the law of the European Union.

The above ordinance aims to guarantee the health of employees when using work equipment. In order to achieve this aim, the law firstly refers to the choice of adequate work equipment and its safe use; secondly, adequately designed work procedures and production processes; and thirdly, the qualifications of and instructions given to the employees. With regard to work equipment in general and electrical devices in particular, the provisions in Part 2 of the ordinance, whose Articles 3 to 14 deal with risk assessment and protective measures, have to be considered carefully. In this respect it is important to focus on Article 5 because this provision deals with the prerequisites for work equipment given to employees.

According to Article 5(3) of the ordinance, the employer is only allowed to provide its employees with work equipment which complies with the applicable health and safety rules. This means that there is an overlap between labour protection laws on the one hand and product safety laws on the other. In particular, the ordinance refers to provisions which transform Directives from the European Union into national (German) law and which were applicable at the time the product was made available on the market. Against this background, it is essential that electrical devices are in compliance with the

--First Ordinance on the Product Safety Act, which is the national (German) transformation act for Directive 2014/35/EU on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits (the "Low Voltage Directive"); and

--Act on the Electromagnetic Compatibility of Devices, which is the national (German) transformation act for Directive 2014/30/EU on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

It is important to be aware that the relevant moment for proving compliance with product safety laws is the first placing on the market within the European Economic Area (EEA).

As regards the protection from electrical hazards, the German Ordinance on Industrial Health and Safety deals with hazards which can directly or indirectly occur when using work equipment. On the other hand, electrical hazards in connection with the installation of the building itself are closely connected with the Workplace Ordinance.

Accident Prevention Regulations

It is important to be aware that in Germany (alongside legal provisions in the area of labour protection laws) accident prevention regulations also exist. These rules have to be followed, too, but they are not issued by the legislator. Instead, the accident insurance agencies are legally allowed to issue these provisions. Since companies have to meet the duties set down in the accident prevention regulations, breaches of these provisions can have negative consequences because the supervisors from the accident insurance agencies are authorised to take measures against companies which do not follow the rules. Apart from this, certain breaches can be sanctioned as an administrative offence.

With regard to electrical devices as working materials, there is a specific accident prevention regulation in the form of "regulation no. 3" of the DGUV, the German Social Accident Insurance association. This regulation deals with electrical systems and equipment. Because of the German regulatory system with its state laws on the one hand and the autonomous laws of the accident insurance agencies on the other, companies have to comply with both regimes on a parallel basis.

Workplace Ordinance

Of key importance in the Workplace Ordinance is firstly its broad scope, as mentioned above. Therefore, this ordinance deals with the installation of the building itself as an important part of every workplace. Against this background, it is not surprising that electrical hazards in connection with the installation of the building are regulated in the Workplace Ordinance. One important point to consider is that there is a presumption of conformity with the ordinance if specific rules are followed. Compliance with the "technical rules for workplaces" lead to this privilege for the employers concerned.

The main duty for employers under the Workplace Ordinance is furthermore the risk assessment according to Article 3. In this regard, they have to prove whether there are hazards for employees when setting up and operating workplaces. Apart from this, there is a new duty in Article 6 which obliges employers to provide employees with instructions regarding the installation and operation of workplaces.

Outlook for Future Reforms

The legislator already mentioned when amending the Ordinance on Industrial Health and Safety that the reform of the rules on protection from electrical hazards must be started later on. Since the reform of the Workplace Ordinance did not refer to this topic, it remains to be seen whether there will be such changes in the near future. For the time being, there will be two relevant laws and the accident prevention regulations as well regulating electrical hazards under German labour protection law.

Dr. Carsten Schucht, lawyer (Rechtsanwalt) (e-mail carsten.schucht@noerr.com) is a counsel in the Product Safety and Product Liability Department of Noerr LLP (www.noerr.com). Dr. Schucht specialises in the fields of product safety law (non-food), product liability law and occupational safety law. He advises clients in all areas of European and German non-food product safety law and provides legal representation before civil and administrative courts in these fields. He also regularly provides legal support in national and international product recalls. Dr. Schucht has published various articles on product safety law in general and placing electrical equipment on the European market in particular.

Noerr LLP is a European law firm founded in Germany with offices in Brussels, Alicante and various CEE-capitols. Noerr's Product Safety Compliance team advises its clients on all questions related to placing products on the European market, defends them against complaints from European market surveillance authorities and conducts product recalls.

Lessons Learned. In the Use of Li-On Battery Technology

Edward Jones

In 2016, it was the decision by Samsung Electronics to recall 2.5 million Galaxy Note 7 Smartphones at a reported cost of $5.3 Billion, eventually discontinuing production altogether. Just a few months before, it was dozens of fires associated with 2015's "must have" Christmas gift, self-balancing hover boards, which have since become borderline contraband, cratering the industry.

There are invaluable lessons to be taken away from these record industry recalls regarding the application of Li-Ion battery technology.

Know Your Source

Many of the fires associated with hover boards were attributable to the use of battery cells from untraceable sources.

The design of Li-On cells must incorporate the use of safeguards (PTCs, vents, vent pipes, Hi thermal separators) and Calorimetric modeling to define safe operating boundaries based on materials and chemistries used.

The production of these cells in volume requires the use of Statistical Process Control in order to ensure consistent production practices and materials are used in the fabrication of each and every cell.

Know Your Application

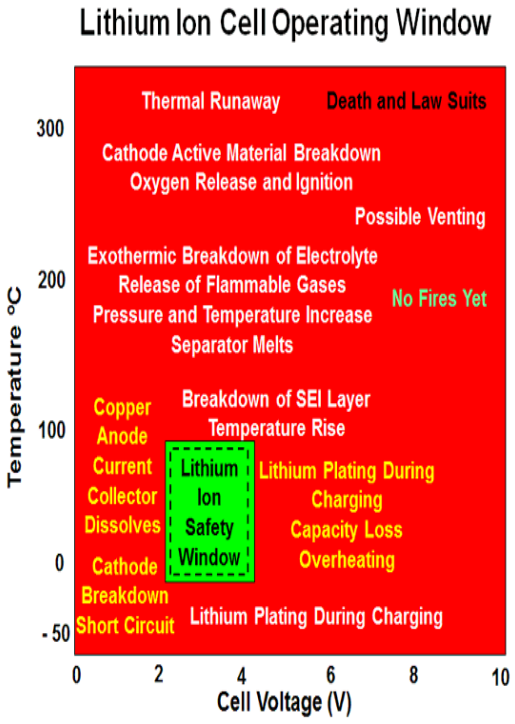
Even with the use of properly designed and manufactured Li-On cells, end-applications must provide a "safe" operating environment for cells through the use of robust Battery Management Systems (BMS) and Mechanical Packaging.

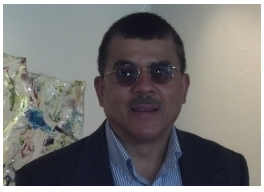
The purpose of the BMS is to safeguard against overcharging and deep discharging of cells (as specified by the cell manufacturer) in a battery pack under normal and single fault conditions. This also includes "charge balancing" ensuring that cells do not exceed specifications due to a change in capacities of adjacent cells in the pack. Future enhancement may also include fault predictive technology (TBD).

The mechanical package must protect the cells from being physically damaged which can lead to thermal runaway and "rapid disassembly" and also (if possible) provide for adequate spacing to mitigate the propagation of failures, within the battery, between cells.

Not A Commodity

While some battery technologies can be readily used in "on demand" production environments without careful consideration of "source" and "application" Li-On technology does not. This is why it is essential that both cells and end designs must be qualified to quality industry safety standards (e.g. for ITE-UL 60950-1 para. 4.3.8).





About the author: Edward Jones is the product safety expert on batteries at IBM, where he has worked for 40 years.

TOUCH CURRENT measurement; Showing how it works

Part 1 of 3 Introduction and eBurn measurement

Peter E Perkins, PE
Life Senior Member IEEE

The introduction to switching electronics has increased the concern as to the effects of these devices on the electrical infrastructure. There is concern that the switching spikes which are fed back into the supply system are affecting the long-term reliability of the infrastructure; these switching spikes initiate electrical discharge in small voids in insulation and are speeding up the rate of partial discharge which speed up the insulation failure, additionally, the triplen harmonics generated are captured in delta transformer windings and heat the windings which speed up insulation failure. The measurement of TOUCH CURRENT is one important element in measuring these feedback switching events and providing a specified maximum level of feedback from equipment in the earth/ground. Another growing issue relates to electronic protection devices, e.g. GFCIs, don't play well with switching electronic loads and the load won't work in some situations.

The assessment of protection against electric shock includes making a measurement of the accessible residual current available to the user under normal, abnormal and fault conditions. This residual current, TOUCH CURRENT, is limited to a small value protecting harm or damage to the user.

This TOUCH CURRENT measurement limit is specified in product safety standards. Commonly used standards for electronic equipment e.g. IEC/EN/UL 60065 'Audio, Video and Similar Electronic Apparatus - Safety Requirements, IEC/EN/UL 60950 'Information Technology Equipment - Safety Requirements', IEC/EN/UL 61010 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use', IEC 62368, 'Audio/Video, Information and Communication Technology Equipment' and IEC 61204-7 'Low-voltage switch mode power supplies – Part 7: Safety requirements'.

All of these product standards draw on the IEC Basic standard IEC 60990, 'Measurement of TOUCH CURRENT and protective conductor current' which describes the measurement circuit details plus the various conditions and details under which the measurement is to be made. The circuit discussion will show how the adjustment has been made for higher frequency current from the traditional electrical body model historically used.

This paper reviews a demonstration showing the setup and conditions for making proper TOUCH CURRENT measurement for some products with emphasis on the proper procedure and interpretation of results; common mistakes in making this measurement will be discussed. The demonstration is augmented by additional examples and explanation.

There is a need to quickly expand peak TOUCH CURRENT measurements to all electronic switching equipment and a maximum limit of 7.1mApk applied in all cases to provide a sound basis for all of these issues.

TOUCH CURRENT requirements, Basic safety standard:

Figure 1: IEC 60990 Basic TOUCH CURRENT measurement standard

From the IEC 60990 introduction:

This International Standard was developed as a response to concerns arising from the advent of electronic switching techniques being broadly applied to power systems and within EQUIPMENT*, giving rise to high-frequency harmonic voltages and currents.

This standard is intended for the guidance of EQUIPMENT committees in preparing or amending the test specifications in their standards for measurement of leakage current. However, the term “leakage current” is not used for reasons explained below.

This standard was prepared under the safety pilot function assigned to TC 108 (nee TC 74), as follows:

Methods of measuring leakage current

This includes, for various types of EQUIPMENT, all aspects of what is referred to as “leakage current”, including methods of measurement of current with regard to physiological effects and for installation purposes, under normal conditions and under certain fault conditions.

The methods of measurement of leakage current described herein result from the review of IEC 60479 series

and other publications, including descriptions of earlier methods of measurement.

The following conclusions were derived from a review of the effects of leakage current:
the primary concern for safety involves possible flow of harmful current through the human body (this current is not necessarily equal to the current flowing through a protective conductor); the effect of electric current on a human body is found to be somewhat more complex than was assumed during the development of earlier standards in that there are several body responses which should be considered. The most significant responses for setting limits for continuous waveforms are

- Perception,
- STARTLE-REACTION,
- LETGO-IMMOBILIZATION, and
- ELECTRIC BURN called eBurn in this paper.

Each of these four body responses has a unique threshold level. There are also significant differences in the manner in which some of these thresholds vary with frequency.

Two types of current have been identified as needing separate measuring methods: TOUCH CURRENT and PROTECTIVE CONDUCTOR CURRENT. TOUCH CURRENT only exists when a human body or a body model is a current pathway.

It was also noted that the term “leakage current” has already been applied to several different concerns: TOUCH CURRENT, PROTECTIVE CONDUCTOR CURRENT, insulation properties, etc. Therefore, in this standard, the term “leakage current” is not used.

Application of TOUCH CURRENT measurement

IEC 60990 defines measurement methods for:
-Monopolar DC or bipolar AC sinusoidal or non-sinusoidal currents flowing thru the human body
-Current flowing thru a protective conductor
-TOUCH CURRENT measurements use a network representing the human body.
Limits are specified by product standards based upon IEC 60479 data regarding effects.

Measurement of TOUCH CURRENT

In the past, EQUIPMENT standards have used two traditional techniques for measurement of leakage current. Either the actual current in the protective conductor was measured, or a simple resistor-capacitor network (representing a simple body model) was used, the leakage current being defined as the current through the resistor.

This standard, IEC 60990, provides measuring methods for the four body responses to the electric current noted above, using a more representative body model.

This body model was chosen for most common cases of electric shock in the general sense. With respect to the path of current flow and conditions of contact, a body model approximating full hand-to-hand or hand-to-foot contact in normal conditions is used. For small areas of contact (e.g. one finger contact), a different model may be appropriate.

Of the four responses, perception, STARTLE-REACTION and LETGO-IMMOBILIZATION are related to the peak value of TOUCH CURRENT and vary with frequency. Traditionally, concerns for electric shock have dealt with sinusoidal waveforms, for which r.m.s. measurements are satisfactory and are most convenient. Peak measurements are more appropriate for non-sinusoidal wave-

forms where significant values of TOUCH CURRENT are expected, but are equally suitable for sinusoidal waveforms. The networks specified for the measurement of perception, STARTLE-REACTION and LETGO-IMMOBILIZATION currents are frequency-responsive and are so weighted that single limit power-frequency values can be specified and referenced.

ELECTRIC BURNS, however, are related to the r.m.s. value of TOUCH CURRENT, and are relatively independent of frequency. For EQUIPMENT where ELECTRIC BURNS may be of concern (see 7.2), two separate measurements are required, one in peak value for electric shock and a second in r.m.s. value for ELECTRIC BURNS.

EQUIPMENT committees should decide which physiological effects are acceptable and which are not, and then decide on limit values of current. Committees for certain types of EQUIPMENT may adopt simplified procedures based upon this standard. A discussion of limit values, based upon earlier work by various IEC EQUIPMENT committees, is provided in annex D. IEC 60990 has quite a number of test setup examples corresponding to the most usual power systems.

Measurement of PROTECTIVE CONDUCTOR CURRENT

In certain cases, measurement of the PROTECTIVE CONDUCTOR CURRENT of EQUIPMENT under normal operating conditions is required. Such cases include:
- selection of a residual current protection device,
- compliance with 471.3.3 of IEC 60364-7-707.

The PROTECTIVE CONDUCTOR CURRENT is measured by inserting an ammeter of negligible impedance in series with the EQUIPMENT protective grounding/earth/grounding conductor.

Test setup with isolation

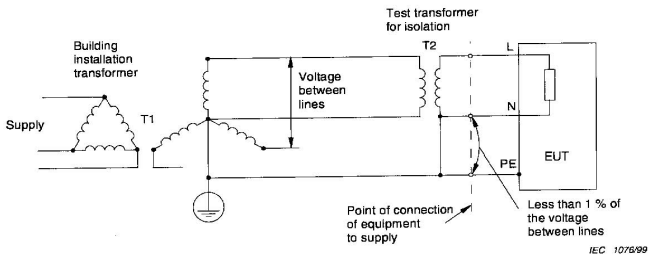


Figure 2 – Example of earthed neutral, with transformer for isolation

Figure 2: Typical single phase test setup diagram

IEC 60990 has nine test setup examples corresponding to the most commonly used power systems both single phase and 3 phases. Enough examples are presented such that test labs should easily be able to adapt their setups to other situations not described.

This Figure 2 example represents a typical North American lab setup.

Simpson 228 meter:

Figure 3: Simpson 228 meter pix

The Simpson 228 is a popular meter which meets the requirements of IEC 60990 by incorporating the measuring circuits of the standard. This meter has been commonly used, especially in North America, for TOUCH CURRENT measurements since 1990.

Other meters and measuring circuits are commercially available for making proper measurements. Some test labs have produced their own measuring circuits and there is descriptive information in IEC 60990 to aid in the construction and calibration of these devices.

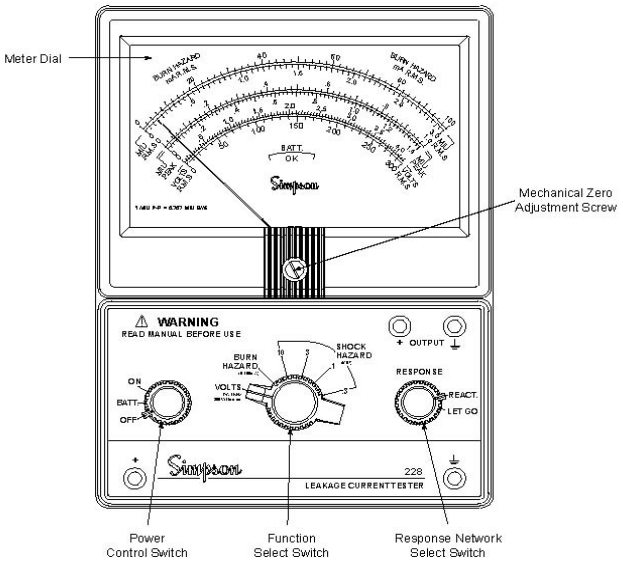


Figure 4: Simpson 228 meter diagram

The Simpson meter functions are clearly seen in the meter diagram from the manual. The VOLTS scale allows the voltage, up to 300Vrms, to be read in the usual way. The BURN HAZARD mode invokes the traditional body model circuit and rms readings will be measured on this scale. Note that in the SHOCK HAZARD modes the proper RESPONSE choice of REACT or LET GO must be selected to use the body model circuit with the proper Frequency Filter for the measurement.

Electric Burn (IEC 60990 Figure 3):

referenced as eBurn in this paper

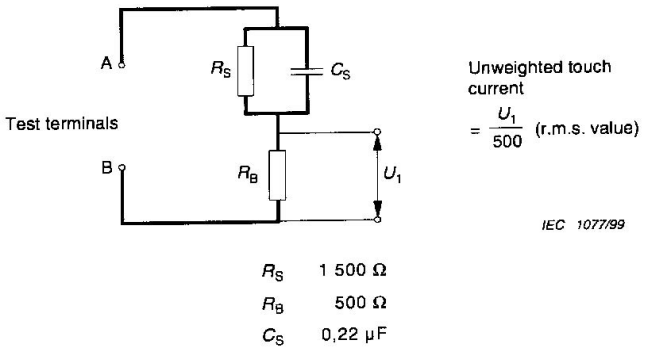


Figure 3 – Measuring network, unweighted touch current

Figure 5: IEC 60990 (Figure 3) measuring network, unweighted TOUCH CURRENT circuit

This circuit is the IEC body model circuit which has been used by the IEC for electric shock protection measurements for about 50 years. The model consists of two parts; Rs and Cs represent the combined skin impedance for two point of contact – in and out, Rb represents the internal impedance of the salty internal body to electric current.

This model is for about 100cm^2 area –about a salad plate size; this is a large area of contact, left hand to both feet, which represents the worst case electric shock scenario as discussed in IEC 60479, 'Effects of current on human beings…'.

Other models would represent other contact situations; e.g. 10cm^2 for the palm of the hand or 1 cm^2 for a fingertip. The capacitance value would be appropriately adjusted for these models. Other measurement circuits for such occasions are not commonly used in product safety standards.

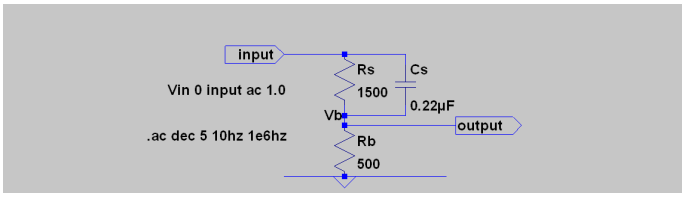


Figure 6: SPICE model for IEC 60990 eBurn circuit

70mA HF eBurn/Figure 3 circuit; eBurn current vs frequency sweep:

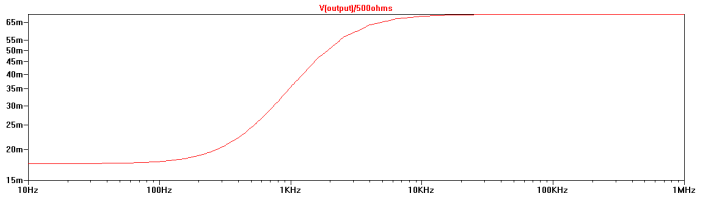


Figure 7: SPICE analysis: 17.5mA at line frequency, 70mA above 15kHz

The SPICE output provides the output voltage, Voutput, for a specified input condition. The measured current is Voutput/Rb or Voutput/500ohms in SPICE parlance; the program provides the calculation when entering the details. SPICE labels the plot as Voutput/500ohms which is, in this case, the eBurn current curve.

This frequency sweep shows 70mA at high frequency which is the eBurn limit for some standards. This value is too large in some situations since it is above the LETGO-IMMOBILIZATION level. The referenced 'TOUCH CURRENT measurement comparison paper', PSES06, covers this in detail.

This next example shows the body eBurn response to 3.5mArms, a traditional TOUCH CURRENT limit in some standards.

3.5mArms LF I(Rb)/Figure 3 circuit; eBurn current vs frequency sweep:

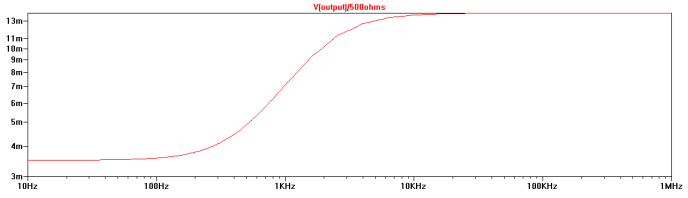


Figure 8: SPICE analysis: 7v input; 3.5mA at 50/60Hz; 14mA above 15kHz

This analysis is starting at the 3.5mA low frequency level and also provides the base-line for the TC measurements discussion following. Although the low frequency value is 3.5mArms, above 10kHz the value rises to 14mArms.

Correspondingly, for 5mArms (the LETGO-IMMOBILIZATION limit) at line frequency would give 20mArms above 10 kHz.

Simple non-sinusoidal comparative example:

A simple eBurn comparison to any switching waveform can be made by analyzing a similar non-sinusoidal waveform example which a triangular wave is provided for comparison to the measurement shown previously.

This also represents the input to the filter circuits for the STARTLE-REACTION or LETGO-IMMOBILIZATION TOUCH CURRENT measurements.

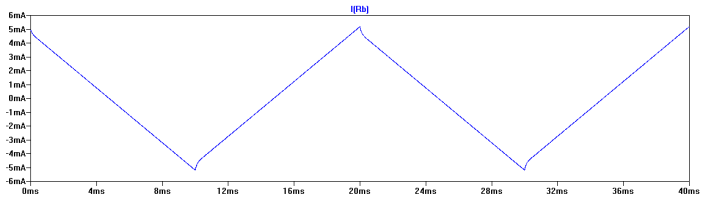


Figure 9: 5.2mApk non-sin I(Rb)=U1 = 2.87mArms; pk/rms ratio = 1.812

This waveform can be easily analyzed and is sufficiently non-sinusoidal with harmonics into the 10s of kHz region. The pk/rms ratio is 1.812 for this waveform (+28% higher than a sin-wave).

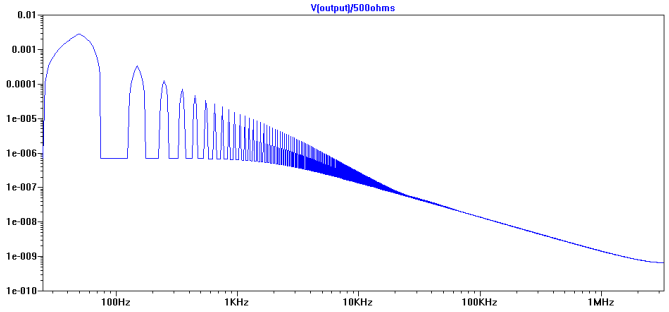


Figure 10: FFT for the triangular waveform of Figure 9

This triangular waveform has harmonics above 10kHz.

Actual eBurn I(Rb) Pix from demo video:

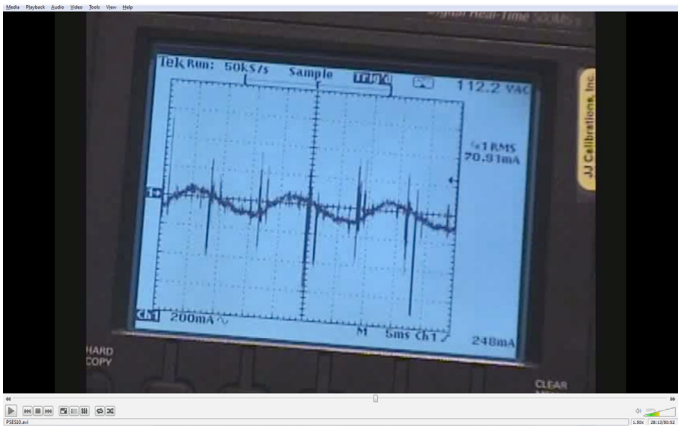


Figure 11: I(Rb) data from demo

Demo[1] setup consisted of two laptop computers operated from a PDU panel. One was a new machine and the other was quite old; a difference in the treatment of PFC expected. Each machine had the battery depleted (charging mode during the test) and was also exercised.

There was no measurable 228 eBurn meter reading; the scope was directly connected to Simpson 228 output. Output represents U1/500 ohms; 1Voutput = 100mArms current.

The scope reading of the Simpson 228 output is primarily the thermal noise floor for the output amplifier.

This is not the expected representation of the U1 output in all cases and should not be considered as such.

1 Bob Johnson of ITE Safety organized and ran the EUT portion of the original demo. I am deeply indebted to him for this as it allowed the author to focus entirely on the TOUCH CURRENT measurement setup and carry on a running explanation as to what was being done and how to interpret the data collected which is reported in this paper.

Another example, a Netbook I{Rb}:

This machine was also operated under maximum load during the testing.

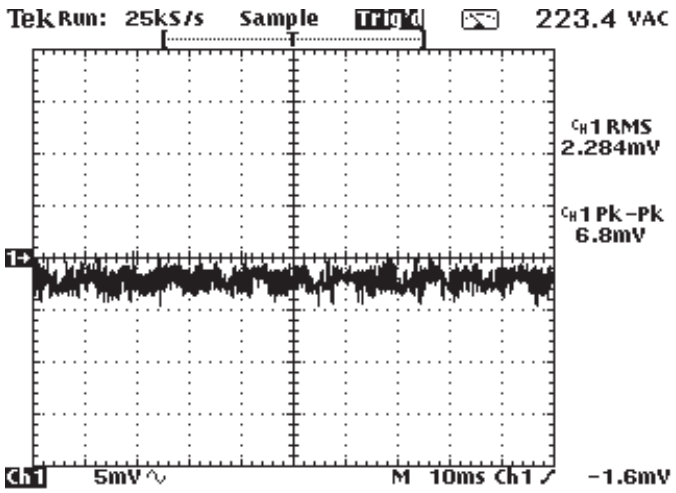


Figure 12: Body current from a small ITE product

The Simpson 228 meter does not wiggle on the 100mA full scale eBurn setting for this measurement.

As with the last scope display, this represents the thermal noise floor for the Simpson 228 output amplifier which is about 0.2 Ma, an insignificant value for eBurn.

This should not be used as representative of the input to the STARTLE-REACTION or LETGO-IMMOBILIZATION filter circuits.

Part 2 will discuss Startle-reaction and Letgo-immobilization measurements.

Peter E Perkins is convenor of IEC TC108/WG5, which is responsible for IEC 60990, Measurement of touch current and protective conductor current, an IEC Basic Safety Publication applicable to all electrical products and product safety standards. He is a Life Senior member of IEEE, has a BS in Engineering from the University of Portland and MSEE from Oregon State University and is Principal in PE Perkins, PE. He has more than 55 years' experience in the electronics industry, at Tektronix, Inc and now as a consultant to industry, specializing in product safety and regulatory affairs for most of that time. He has been continuously involved in giving technical presentations at PSES/ISPCE from the beginning. He can be reached at p.perkins@ieee.org.

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- Promotion and coordination of Product Safety Engineering activities with multiple IEEE Societies.

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