Volume 13, No 1

PRODUCT SAFETY ENGINEERING NEWSLETTER

What's Inside

Editor's Message

Dear Readers,

Happy New Year! I wish you all the best for 2017.
For the last year,we have experienced a big breakthrough for the PSES TaipeiChapter. That is, the first ISPCE-TW was held at NTNU in Taipei, Taiwan, on December 22, 2016. I would say this event might be one small step for IEEE, but definitely one great leap for IEEE PSES.

The ISPCE (IEEE Symposium on Product Compliance Engineering) has been a symposium held annually in the States for over ten years, and the PSES Taipei Chapter was extremely honored to hold the first ISPCE-TW in Taipei, which also represents the first one in Asia. In the symposium, around 100 attendees were in the venue. Furthermore, we were pleased to invite our new president John, the VP of Conferences Stefan, and the previous president Elya to attend and give us inspiring speeches as well. For the follow up, we plan to invite some speakers to summarize their presentations to technical papers for submission; so you may start to look forward to receiving the next issue now!

In this issue you will find our new president's message, the Chapter and TAC activities, a calling of applying for an elevation to become the IEEE senior member, and the Conference News along with an exciting opportunity of volunteering work. Last but not least, we got a technical paper from Peter E Perkins. I believe this issue has strong potential to become a great help to your career.

Still, we need your dedication and cooperation to continue to support this Newsletter as a platform for sharing knowledge and communicating with the peer. Let's work together to make it contain useful information which is enormously beneficial to your career development as more as possible. As a result, any contributions of articles with a variety of topics that are of interest to our readers are welcomed. 2017 is expected to become a fruitful year with prominent 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 12, No. 4 - December 2016

President's Message

Hello,

We have recently gone through significant changes on the board. Mark has had to step down as President and I will now be Acting President through the remainder of his term. I'd like to thank Mark for his efforts and contributions. He will remain on the board and will step back in as Immediate Past President in 2018.

I was intending to use this year as President Elect to learn about the role and create my vision for my term as President. Of course that has now been accelerated, but please be assured Kevin (Immediate Past President) and all the board members have been wonderful in helping me get acclimated. I've always been passionate about safety and hope to carry that over into this new role.

I look forward to serving the Society and working with everyone. I take the responsibility seriously and will give it my full attention. Those before me have led us down an incredible journey from a Technical Committee to a full blown Society, which took a lot of hard work and dedication. I will not let that work go in vain and I am honored to lead us into the future.

Thank you for your support moving forward!

Sincerely,

John Allen
Acting President

Chapter and TAC Safety Probes

News about Chapters and Technical Activity Committees

PSES Chapters in Action!!!

If you go to http://ewh.ieee.org/soc/pses/chapters.html you will find that we have a number of chapters in a wide region of the globe – from Israel to Australia and in many areas of the U.S. The chapters have a wide range of activities, ranging from a couple of meetings a year to a meeting and other activities nearly every month. I encourage you to see what's going on.

Our IEEE dues go in large part to the local IEEE section to support technical and other local activities. We benefit professionally from the training and resources that the sections provide. As PSES Chapter Coordinator, I'm here to see how the Society can help with ideas and technical support. It's a complicated arrangement! But the system is intended to serve needs in different areas of the country and the globe. When you travel on business, I would encourage you to experience local meetings and professional "cultures." You never know when such experiences and contacts will be helpful in your career. Again, this is what IEEE and the PSES offer. It's up to you to take full advantage of the resource – and that includes the experiences of volunteering and leadership development.

As 2016 draws to a close, we look to how we can build for the future. One way is for each chapter to take a close look at the criteria for the PSES Chapter of the Year Award. Look back at what you accomplished in 2016 and consider what we, together, can accomplish in 2017. Our Chapter of the Year Award has a pedigree going back more than twenty years to when we were TC-8 of the EMC Society. I saw what a friendly competition could do to motivate activities that benefited the membership. January 31, 2017 is the deadline for Award Nominations for 2016 Chapter of the Year to be presented at ISPCE in May of 2017 in San José, CA (a.k.a. Silicon Valley)

The criteria are an indication of what a chapter should try to accomplish:

1. How many meetings did you have in 2016?
2. What was your average attendance?
3. Please list any special activities.
4. How many new members?
5. Do you have a website? Kept up to date?
6. Have you had an officer election in the last two years?
7. Did you have representation at this year's ISPCE?
8. News/notes to PSES Newsletter or Chapter Coordinator?
9. Anything else to report?

If I were to give out an award for PSES Member of the Year, it would be for members who were active in their chapter leadership, providing a bit of time and creativity for their chapters to help build professional activities for all our members. I would encourage everyone to "do their part." I know this is tough when we're busy with work and family, but if all members pitch in it's not much of a burden – and you build a real resource that may be vital at some later point in your career – or that of a colleague.

Whereas we don't have a Member of the Year Award, we do have Appreciation awards. By all means, nominate someone who has done a lot for your chapter for that award (contact grant.schmidbauer@nemko.com)

Changing gears – What if you are located in an area that doesn't have a local PSES chapter? There are a number of different options. If you look at our chapter page, you may notice that there are several joint chapters. These groups joined with other IEEE societies to get the mass needed to have meetings and other activities. The local section is key to arranging this. I'm pretty sure that there is an IEEE section in the locality of all our members. Some of our chapters have paired up with the EMC Society, which is kind of our "Godfather."

Sydney, Australia is joint with the Consumer Electronics and Broadcast Technology Societies; Vancouver, B.C. with the Reliability Society. Toronto is the Engineering and Human Environment Joint Chapter. Now that's creative!

There are certainly issues with having joint chapters. There are pros and cons to sharing areas of interest. For me, the bottom line is what's the most effective way to have stimulating meetings and other activities. I like being exposed to different technologies and cultures (yes, product safety and regulatory engineering have a different culture than consumer electronics – but they do overlap.) Personally, I prefer having diverse meetings on a variety of topics rather than trying to go to all the different society meetings that are available here in Silicon Valley.

If you do not have a local PSES chapter, there is the possibility of a "virtual" chapter. Personally, I like the physical camaraderie of real meetings, but given current technology a VC is certainly possible. But, as with almost anything worthwhile, it will require an effort on the part of at least several members. We have very large LinkedIn group that could be the base of a virtual format. Mariel Acosta-Geraldino (mariel@US.IBM.com) is the one to contact.

PSES is doing its best to provide "value" for our members. One way to do this is to keep in touch with our colleagues. What's going on? In the past, I've offered to act as a go between to get chapter information to the PSES Newsletter. It hasn't really worked. It's almost as much work for me to get the information, as it would be for someone in each chapter to take photos and write a couple summary paragraphs for the Newsletter. Please ensure that your chapter activities are documented and include lots of photos with identifying captions. I want to see how everyone else is aging!

So… 2016 was a notable year; how can we improve in 2017?

Murlin Marks, Life Senior
PSES Chapter Coordinator

North Texas Product Safety Engineering Society Update

The North Texas IEEE Product Safety Engineering Society was formed on May 27, 2014, co-founded by its initial leaders Jonathan Jordan (ESI, Dallas) and Jim Bender (Texas Instruments).

The chapter continues to evolve by developing and implementing events of interest needed to grow local product safety professional participation, with a focus on key product safety, regulatory and compliance interests.

To date, we have hosted an interactive regulatory compliance, ethics "reenactment" (Ethics in Engineering, Making Right Choices) at an IEEE Young Professionals gathering along with recent Central Texas Product Safety Engineering Society meeting in Austin. We also hosted a tour of Intertek's Plano hazardous location evaluation laboratory (picture attached) complete with an on-site demonstration of a hazardous location explosion.

As the chapter enters its third year, we hope to continue building up our membership and future leadership which is currently composed of Jim Bender, Chair (Texas instruments), Curtis Thornburg, Co-Chair (Underwriters Laboratories), Lauren Delgallego, Secretary (Intertek) and Jonathan Jordan, Treasurer (ESI, Dallas).

North Jersey PSES/EMCS Chapter Fall Meetings

September 29th

It's a joint meeting with IMS. The presentation was by Amplifier Research on a Multi Tone Generator for RF immunity testing. AR RF/Microwave Instrumentation has developed a product which uses a patented test process that adds additional test frequencies, or tones, for each test period, or dwell time. Rather than testing one tone per dwell period, they add additional tones to effectively increase the test efficiency by a factor approximately equal to the number of tones used. For example, if four tones were used, the test would be completed in about one quarter of the normal time or four times faster.

Multi-tone testing has many benefits. While the multi-tone methodology was initially implemented to increase the speed of immunity testing, it has been found that this method also improves equipment efficiency, offers greater flexibility to truly test the equipment (EUT) under real world threat conditions, and can be fully compliant to standards. Benefits can also include more efficient use of finite financial and human resources as well as faster time-to-market for new and enhanced products.

Carl Mueller was the presenter. Carl is a Systems Engineer for AR RF/Microwave Instrumentation's Radiated and Conducted Immunity Systems, EMI Receiver, and test software. Carl is actively involved in product and system design, development, and testing as well as worldwide sales and customer support. With well over 20 years of experience in military systems integration and testing, Carl has worked as a Principle System Engineer on radar warning receivers, communication jamming systems, and aircraft simulated training systems. His background includes extensive client contact, including on-site customer training. Mr. Mueller worked for AEL, Tracor, Marconi, BAE Systems, Cobham, and ACCUSORT Systems prior to joining AR.

The meeting was held at New Jersey Institute of Technology and was attended by IEEE members, students, and faculty.

November 10th

It's a joint meeting with IMS. Don Gies presented his paper given at 2016 ISPCE that examines the frequency response of human body-simulating impedance networks found in information and communication technology, safety standards, then explores their reactions at radio frequencies used for wireless telephony. It explores the possible existence of human-body inductance, resonance and skin effect. Finally, it postulates a working model for evaluating the safety of high-power circuits operating at radio frequencies.

Don Gies has worked as a product compliance engineer since 1986. Since 1989, he has been in his present position at AT&T-Bell Laboratories/Lucent Technologies/Alcatel-Lucent (now Nokia) as a lead subject matter expert for his company in the field of global product safety compliance, working primarily with wireless base station equipment. Mr. Gies is also an adjunct professor at New Jersey Institute of Technology (NJIT), Newark, New Jersey, USA, teaching graduate-level courses, "Transients in Power Systems," and "Economic Control of Interconnected Power Systems." Prior to working at AT&T, Mr. Gies

was a Tempest engineer for Honeywell-Signal Analysis Center, where he worked on various secure communications projects for the US Army Communications -Elec-

tronics Command. Mr. Gies graduated from Rutgers University - College of Engineering as an electrical engineer. The meeting was held at the Nokia-Bell Labs and participants were able to tour the Bell Labs museum before and after the meeting.

two pictures of the museum

Santa Clara Valley Chapter

On November 30, 2016, Jon Derickson of Google made a presentation on Self-Driving Cars: Overview of NHTSAs Federal Automated Vehicles Policy. The meeting was sponsored by the Santa Clara Valley chapter and held at Google Mountain View and it was very well attended. The Google self-driving car was on display at the meeting and this brought significant interest. The chair of the PSES SCV, Cherie Forbes opened the meeting with a welcoming introduction. Jon Derickson provided an overview of the NHTSA guidelines with an interactive presentation to help the audience understand the impact of the new requirements.

NHTSA has categorized autonomy into five levels and Jon Derickson provided the audience with many examples of how vehicles may be classified under those different levels. There was much interest during the presentation and the audience had many questions related to the new and emerging technology and the safety policies. The National Highway Traffic Safety Administration recently issued these guidelines which will help provide guidance for manufacturers of autonomous vehicles. There's been a lot of progress related to the technology of autonomous vehicles and it was great to hear about the latest updates through the IEEE PSES Santa Clara Valley chapter. This has definitely been of value for PSES and other IEEE members.

IEEE Senior Member

Many people have been IEEE members for a long time. They may have started as students when they were in college. Probably, the last change they did to their membership status was going from student to professional, which they probably remember impacted their wallet! Perhaps because of this, a lot of IEEE members leave their memberships status at the most basic level. Maybe you are thinking if you change your membership status to senior member it will cost you more. It does not. The process is not very difficult. It does not require you to go back to your Alma Mater and request a transcript, and if upgraded, the senior membership gives you added peer recognition.

Where to start?

There are tons of info in the IEEE website, just do a search using IEEE membership. If you do not know your membership status, your status is probably Member grade. 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.

As part of the increased visibility mission for the society, we plan to broadcast the people who just got their membership status elevated. Keep your eyes open and when you recognize someone in the list who has worked with you, approach them with the request to sponsor you.

To top it off, you get this really cool plaque! You can see me in the picture showing off mine!

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IEEE PSES VP of Member Services
Mariel Acosta-Geraldino
IBM Corporate Program Manager of the Americas - Product Safety
IBM Corporation, Tucson, AZ
IEEE Product Safety Engineering Society- VP of Member services/ Board of Governors
Tel: (520)799-4136/ TL 321-4136
mariel@us.ibm.com

IEEE PSES would like to recognize 2016's new PSES IEEE Senior members, Congratulations on this milestone!

November 2016 review meeting
William Bush
Robert Griffin
Jeff Pasternak
Scott Raszeja
Allan Saadus
Peter Walsh

Sept 2016 review meeting
Frank Dominguez
Fabio Furlan
Julio Posse
Lei Wang

July 2016
Mariel Acosta-Geraldino
V Jayaprakasan
Harry Jones

June 2016
John Allen
Roderick Muttram
Paul Robinson
Richard Stern

May 2016
George White

April 2016
Azim Karimi

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Conference News

Stefan Mozar, the PSES VP of Conferences

Our flagship conference the IEEE 2017 ISPCE will be held in Santa Clara. Santa Clara was chosen because every time we held the symposium there we achieved growth. Growth in the number of attendees and industry participation. This is due to the Silicon Valley location, where there is a large industry participation and where the world's most active chapters are. Thus, our society has decided to keep the ISPCE in Santa Clara for the next three years. We will analyze the results of this action, and then decide whether we permanently keep the symposium there.

"Parking" our flagship symposium means our outreach to other areas would be reduced. To keep engaged with our members, we have decided to start a new symposium, one that will continue to roam around North America. This new symposium will be held in the fall of 2017 in the Boston area. Steve Brody, who is well known in the product safety community, has taken on the task of being the inaugural general chair. We are excited to see Steve manage this new addition to our symposia. Adding this extra event allows us to reach out more to our members and have a greater opportunity to interact with them.

On the 22nd of December 2016 our Society held its first event outside of North America. The event was a one day workshop on product safety and compliance that was held in Taipei, Taiwan. The event was conducted in English and held in the National Taiwan Normal University (NTNU). The General Chair was Professor Wen-Chung Kao, with the strong assistance of the Taipei PSES Chapter (Claire Tsai and Maxi Tsai), and support from the NTNU hosted an outstanding workshop. This workshop is an excellent lead up to the 2017 ISPCE Taiwan. The event had a number of invited speakers, and over 80 attendees. The 2017 PSES President John Allen came to support the first Asian event. Past PSES President Elya Joffe represented iNarte, the PSES VP of Conferences, Stefan Mozar, also attend. This event was a major milestone in the history of our society. A detailed report will be published in the next newsletter.

The ISPCE-TW General Chair Professor Wen-Chung Kao(right) and the 2017 PSES President John Allen(left)

Stefan Mozar is giving a speech about Probabilistic Safety as the keynote speaker.

The audience are listening to the speeches attentively and answering the questions.

The discussion among the participants during the coffee break

A group photo after the symposium.

Thus 2017 promises to be an interesting year for the PSES in terms of conference development. With two new events on the calendar we will be able to better interact with our members and the product safety community. Reaching out to Asia, where many consumer and computer products are developed and manufactured is a very significant milestone in the growth of our society and in the outreach to industry and academia.

Our symposia have caught the attention at higher levels in the IEEE. In IEEE's attempt to engage more with practitioners our society and our symposium stands out in industry participation. Thus 2016 IEEE President Barry Shopp will be attending the 2017 ISPCE in San Jose. As the program comes together in the next few weeks, keep an eye on it and mark your calendar to make sure you don't miss the product safety and compliance engineering event of the year in the USA.

Interested in doing Conference Volunteer work with PSES?

A number of opportunities are coming up to do volunteer work in the area of conferences with our society. We have three conferences that will provide opportunities to get involved.

Being a volunteer has a number of benefits. First of all you will be able to participate in activities that interest you, and of which you can be proud of. It will help you expand your knowledge and expertise. That is, it will add value to your career!

You will be able to build a global network of professionals in your field, not to mention the friendships that you develop. As you build your network, you will become well known in your field of expertise. This helps build your reputation, and you will find that you develop skills and grow both as a professional and as a person.

Volunteering helps build leadership and management skills, which can help you to grow in your profession. These skills are transferable to your day job, and will enhance your career.

What opportunities exist in the conferences world?

We typically operate within a 12 month window to organise a conference. Thus we need people who are able to help in many different ways. As a conference volunteer you do not have to live in the city where the conference will be held.

What opportunities are available?

1. Support the technical program committee
   a. Review submission in your area of expertise
   b. Chair sessions
   c. Support session chairs
2. Help with conference marketing and promotion
3. Assist with conference planning
4. Assist with conference logistics

What conferences can you help with?

1. Our flagship conference the ISPCE in San Jose, California for 2018
2. The roaming conference that will be held in the Boston area in 2017
3. Our Asian conference that will be held in Taipei, Taiwan in 2017

You do not need to have any experience in conferences, you will get “on the job” training, make new friends and have a great time. The required time you commit to will vary depending on the role you will take, but allow an hour or two a week for entry positions.

Your next step:

If you are interested in volunteering, please email Stefan Mozar, VP Conferences at s.mozar@ieee.org and provide the following information:

1. Your name
2. Preferred email address
3. Contact number
4. Areas of interest in conferences
5. Which conference you would like to help with.

We look forward to hearing from you, and for your support to our activities.

Looking at SMPS develoment history and the effect on electric shock protection

Peter E Perkins, PE
Life Senior Member IEEE

It took about 30 years for semiconductor devices to become robust enough to handle direct switching of mains circuits at useful power levels. This allowed for the development of mains operated Switch Mode Power Supplies (SMPS) which expanded rapidly into consumer and commercial equipment. These new supplies, regardless of more complex electronically, were smaller, lighter and more efficient than the older conventional power supplies. Suddenly the world was flooded with a myriad of products using this new technology.

An aside for a little history lesson of significance to this discussion. In the Spring of 1982 the British declared war over the Argentinian occupation of the Falklands Islands. Although we won't review the details of the conflict, it is significant that Queen Elizabeth II went on National television to announce the deployment of British treasure to reclaim the islands for the Crown. Brits hurried home from work to hear their Queen announce the commandeering of the QE2 to transport troops into this effort. They all turned on their new Japanese built TVs, which contained the 1st cycle native SMPS applied to consumer products. Quickly in metropolitan areas across Britain there were severe electrical brownouts and blackouts.

The investigation led to the understanding of the issues involved. These 1st cycle native SMPS used the switching of the mains semiconductors to generate a higher frequency power signal which could then be converted to the needed operating voltage for the product. Unfortunately, in this 1st cycle native design the current drawn from the line was not taken in the traditional sinusoidal way, rather, only near the peak of the current waveform where very high currents were drawn for a short time to recharge the output capacitors. A typical input current waveform is shown in Figure 1 trace B. This action generated substantial harmonics which were fed back into the power system. The situation was so severe that there were not enough standby replacement transformers and it took weeks to restore power to normalcy.

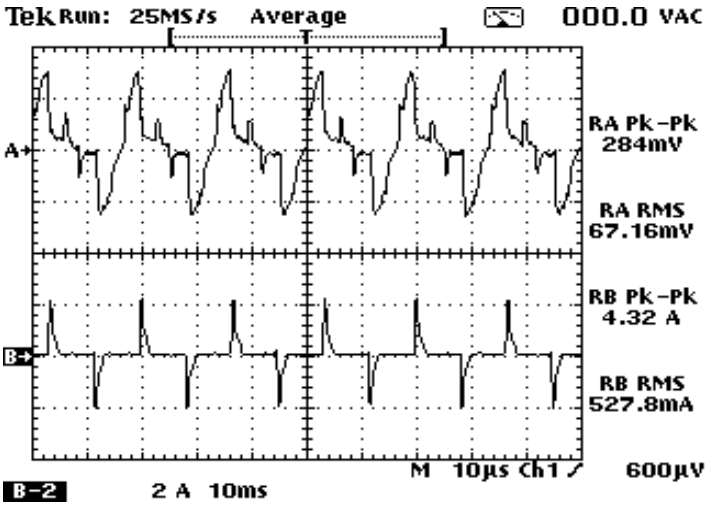

Figure 1: Native SMPS input current waveform (B)

Key to understanding the specific problem is that in the UK metropolitan areas three phase delta primary medium voltage power is delivered locally and the low voltage distribution is made to users from the way secondary side of the system. Each secondary winding can feed up to 800 or 1000 users; therefore, thousands of users were all feeding harmonics back into each power transformer.

The triple harmonics generated by all these TVs are fed back to the secondary windings and are transferred into the delta primary winding where they become circulating currents which overheat and destroy the transformers. Since it could not quickly be corrected this problem led to a huge outcry which resulted in the

requirement for correction of the input current to a sinusoidal waveform; this has resulted in Power Factor Correction (PFC) being required in switch mode power supplies. PFC consisted of the addition of another switcher which focuses on getting the needed sinusoidal input currently working at the same time as the original switcher supplying the load current. Figure 2 shows an example of a PFC corrected SMPS input current (waveform B which is indeed sinusoidal).

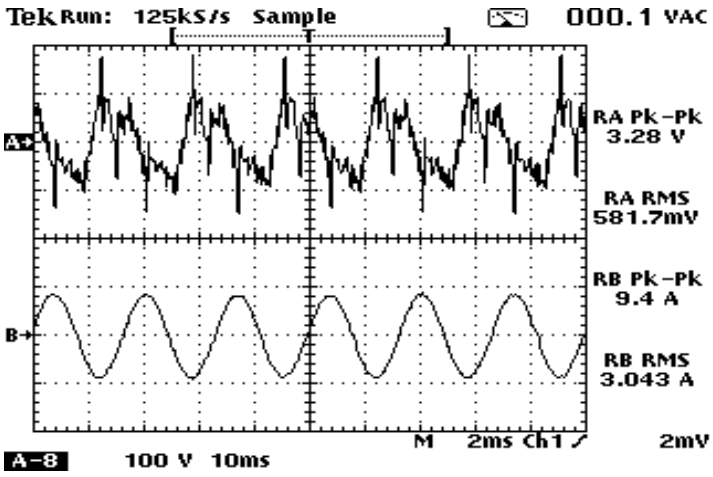

Figure 2:PFC corrected input current SMPS (B)

The design of these SMPS is complex and there is a handful of common topology used for design – starting with buck designs or boost designs and getting more complicated; there is no need for these two switchers to use the same topology for their design in any given product. Further, these SMPS generates a lot of HF noise, both conducted and radiated. The entire family of European EMC requirements is primarily aimed at controlling these unwanted signals.

Next to EMI issues, one of the important signals to be monitored is the leakage current coupled (purposefully or inadvertently) to earth/ground, which is touch current – the control of which is an important element of electric shock protection. As can be seen, the touch current from these power supplies shown is not sinusoidal. Touch current Figure 1 waveform A shows significant waveform distortion and Figure 2 waveform A is even more distorted.

The need for proper measurement of these non-sinusoidal touch currents have been the subject of changes in safety standards for electronic products and continues to be introduced to a broader range of products as switching electronics are more ubiquitously introduced. IEC 60990 'Measurement of touch current and protective conductor current' specifies the proper measurement circuits and conditions to minimize electric shock in this equipment. This proper measurement specifies peak values for non-sinusoidal waveform and the body behavior as a function of frequency is taken into account. These requirements have been used for a long time in IEC standards such as IEC 60950 and IEC 61010. The latest implementation in IEC 62368 and IEC 61204-7 does a better job of implementing the needed requirements.

A new challenge is being introduced as the new energy efficiency requirements come on line. These requirements lower the standby power (soft switch off) to extremely low levels. Implementation of these requirements in the SMPS hardware is commonly being done by adding a third switcher into the design.

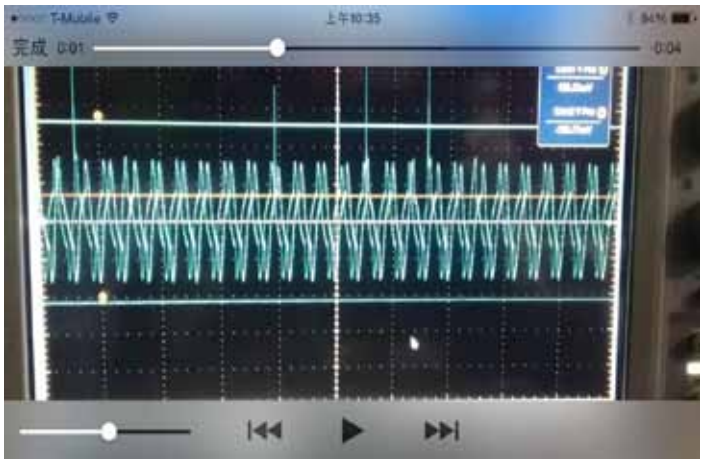

Figure 3: Aperiodic touch current impulses on top of usual waveform

One implementation of an energy efficient standby mode introduces aperiodic impulses into the touch current waveform; the touch current from this implementation is shown in Figure 3. The evaluation of this waveform is not as straightforward as it involves combing bipolar/ac and monopolar/dc requirements, but the methodology is well understood and properly covered in IEC 60990 and the latest version of IEC 62368.

The design element that controls the peak amplitude of these touch current waveforms is the di/dt rise time of the switching circuit. Figure 4 shows how increasing the rise time for a fixed square wave increases the measured touch current at the fast rise time. At the longer times the touch current is at the limit value and rises quickly to the much higher value shown.

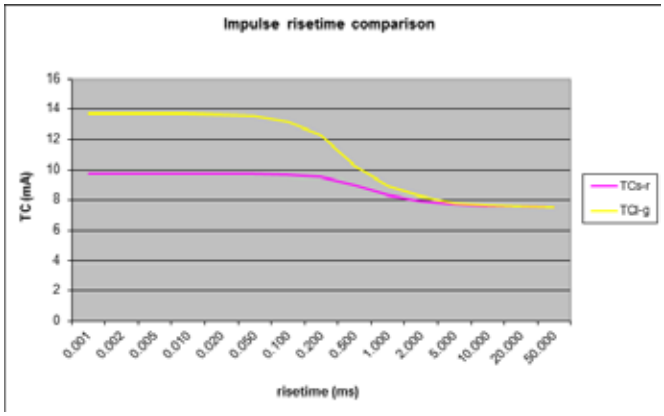

Figure 4: Increase in touch current due to shorter rise time

With the ubiquitous spread of SMPS and their variants into many types of products there is evidence and a growing concern as to the compatibility of these units with the usual safety protection devices (GFCI or RCD) which would undermine the protection if the devices are not harmonized for this interaction.

All of this presents new technical challenges to the product designer as well as to the product safety evaluation staff. Product safety standards will continue to upgrade their requirements to properly measure these touch currents and limit the value to the safe level specified. The waveform will have to be carefully measured to ensure compliance. This also means that there are opportunities to learn some new aspects of the things we deal with every day and grow in response to that.

PFC history.docx

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About the author:

Peter E Perkins, BS Eng., MSEE, PE is a Life Senior Member of IEEE. In more than half if his 30-year career at Tektronix, Inc. he was Corporate Product Safety and Regulatory Affairs Manager. After leaving that company he started his own Product Safety and Regulatory consulting company which he still operates. He is a recipient of the Michael J Demartini award of the IEEE EMC-PSTC, forerunner of the IEEE PSES today; he is an ongoing contributor to the IEEE/ISPCE symposiums from the beginning. He is involved in IEC te chnical standards work with IEC TC 66, IEC 61010 series 'Safety of electrical equipment for measurement, control and laboratory use' as well as IEC TC 108, IEC 62368 series 'Safety of audio/visual, information and communication technology equipment' plus Convener of IEC TC 108/WG5, IEC 60990, 'Measurement of touch current and protective conductor current'. He has received the IEC 1906 award which, honors exceptional leadership and technical contributions to IEC standards.

HP Inc. is a multinational information technology corporation headquartered in Palo Alto, California, USA.

HP Inc. launched on November 1, 2015 as the successor of Hewlett-Packard, along with Hewlett Packard Enterprise. HP Inc. develops and provides personal computer and printer hardware. As a publicly listed Fortune 100 corporation, HP Inc. is a global leader in printing and personal systems; the company is focused on creating technology that makes life better for everyone, everywhere.

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The Value of this Symposium

The IEEE PSES Symposium provides attendees an interactive experience on the latest advancements of product safety engineering. Through multi-disciplinary presentations and cross-functional dialogue, first time attendees and veteran attendees can take away the tools necessary to meet today's challenges. Both IEEE members and non-IEEE members are welcome to attend.

Who Should Attend

The symposium is a forum for exchanging ideas, practical experiences, work experiences and business cards. The targeted audiences include but not limited to people involved with safety engineering in these areas of interest:

- Inherently safer products and equipment
- Product Safety services
- Training and continuing education
- Regulations and standards
- Risk management
- Workplace product safety
- System and Software safety
- Human factors

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The people who would most benefit in attending the symposium are, but not limited to:

- Technicians
- Engineers
- Certified Technicians & Engineers
- Consultants
- Educators
- Administrative Personnel
- Local, State, & Federal regulators
- National standards committee members
- International standards committee members

For additional information and the for the very latest details about the symposium, please visit our symposium website.

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