Agenda
IEEE EMC Society TC 5: High Power Electromagnetics (HPEM)
Wednesday, 2 August 2023 (Noon-1:30 PM EDT)
Riverview Overlook D, Webex 2633 680 1521
Grand Rapids, Michigan USA

1. Opening of the meeting and approval of the agenda	W. Radasky, Chair
2. Review and approval of the minutes of the last TC 5 Meeting in Spokane, Washington, USA	W. Radasky
3. Present TC 5 membership list	W. Radasky
4. Report on the paper review process for Grand Rapids - Review Tutorials, Special Sessions, Regular Sessions	W. Radasky
5. Report from the Lightning Subcommittee	F. Rachidi, M. Rubinstein
6. Report from the EM Information Leakage Subcommittee	Y. Hayashi
7. Report from the HEMP/IEMI Subcommittee	M. McInerney, W. Radasky, S. Fisahn
8. Report from ESD Subcommittee	S. Marathe, M. Khazhinsky
9. Coordination with SC 1, Smart Grid	M. McInerney, Chair SC 1
10. Status of the TC 5 web page	M. McInerney, TC 5 Vice Chair
11. Review of HPEM activities since last TC 5 meeting (Spokane)	All
12. Discussion concerning whether tutorials, workshops, and/or special sessions should be organized for next year in Phoenix, Arizona, USA	All
13. Discussion of standardization activities PAR 2838 Lightning Test Standard Working Group Meeting	All
14. Note the status of TC-5 officers (serving 3 year term, ending 31 December 2025)	All
15. Any other business	All
16. Adjournment	All

IEEE TC 5: High Power Electromagnetics (HPEM) Technical Committee

Minutes of Spokane In-Person Meeting
Wednesday, 3 August 2022 (Noon – 1:30 PM Pacific Daylight U.S. Time)

Confirmed Minutes

1) **Opening of the meeting and approval of the agenda – Bill Radasky, Chairman**

Chairman Dr. William (Bill) Radasky brought the meeting to order at 12:13 PM, Pacific Daylight Time. It is noted that this was a physical meeting with 2 individuals attending virtually (with some difficulty due to problems with the virtual system). There was a slight delay in starting the meeting as the lunch food was outside of the room instead of inside as usual. Both the Chairman, Bill Radasky, and the Vice Chairman, Mike McInerney were present. The Secretary, Pina Dall' Armi-Stoks, was not present. Radasky welcomed the attendees, reviewed the agenda and asked for suggested changes; none were offered. Radasky made a motion to approve the agenda. Motion Seconded and Carried (MSC).

2) **Review and approval of minutes of previous TC 5 meeting – Bill Radasky, Chairman**

The unconfirmed minutes from the virtual TC 5 meeting scheduled for Glasgow, Scotland on 28 July 2021 were approved without any changes.

3) **TC 5 membership list update – All**

The TC 5 membership list covering the past 5 years was reviewed. The previous membership list was displayed without email addresses, and it was noted that several attendees during the past 2 virtual meetings do not have email addresses known. Thus it will not be possible to reach them by email. We had 20 attendees at this meeting with 18 in person and 2 virtual. We do not publish the detailed 5-year list on the website or in the minutes, as there may be private information contained in it. Only the officers' and subcommittee chairs' email addresses are published on the website, and this procedure has been approved by the IEEE.

4) **Report on the paper review process and sessions for Spokane – Bill Radasky**

Radasky reviewed the paper review process for this Spokane conference and also the tutorials and special sessions that were presented. There were 2 regular, 1 abstract and 11 special session papers submitted; 13 were accepted. We ended up with 2 full special

sessions (EM Information Leakage and HEMP) and one tutorial dealing with HEMP. In addition we supported an "Ask the Experts' panel.

We had a large contingent of reviewers this year, and they should be recognized for their hard work. The reviewers were: Butterfield, Hayashi, Horton, Khazhinsky, Leferink, McInerney, Minteer, Nam, Radasky, Savage, Schamiloglu, Shen and Willemen.

The 2 special sessions were presented on Wednesday and Thursday mornings:

- SS-WE-AM1-TC5: Wednesday, 3 August 2022
  - Hardware Security for Smart Society – Parts 1 & 2
  - Organizer: Yuichi Hayashi

- SS-TH-AM1-TC5: Thursday, 4 August 2022
  - E1 HEMP Coupling to Power Substation Cables – Parts 1 & 2
  - Organizers: Robert Olsen and William Radasky

A tutorial was presented on Monday morning:

- TU-MO-AM-3: Monday, 1 August 2022
  - Recent Advancements in HEMP, EMP, and IEMI Protection – A Global Perspective
  - Organizer: Frank Sabath
  - Presentations by: Tara Kellogg, Eric Easton, Nicolas Mora, Frank Sabath

With regard to the "Ask the Experts", this was supported by TC 5:

- Ask the Experts: Tuesday, 2 August 2022
  - Understanding the Havana Syndrome
  - Organizer: Robert Olsen
  - Experts: Ken Foster, William Radasky

It is especially notable that 3 papers submitted for this conference, all in the special session dealing with E1 HEMP, were nominated for best conference paper. Although they were not selected, it is an honor to be nominated. The papers are:

- Simulation of EMP Coupling Using Electromagnetic Transient Solvers," Joshua Butterfield and Randy Horton
- "Coupling of E1 High-Altitude Electromagnetic Pulse to Signal and Control Wires in an Electric Power Substation Yard Trench," Robert Olsen, Joshua Butterfield, Johnny Moore and Timothy Minteer
- "The Application of NEC-4 to E1 High-Altitude Electromagnetic Pulse Coupling to Electric Power Substation Yard Cables," Johnny Moore and Timothy Minteer

In addition, the 1 regular paper accepted for this conference was nominated for best student conference paper. It was not selected, however, it is an honor to be nominated. The paper is:

- "Modeling an ESD Gun Discharge to a USB Cable," by Yang Xu, Jianchi Zhou, Daryl Beetner, Javad Meiguni, David Pommerenke, Sergej Bub, Steffen Holland

In addition to the paper reviews for this conference, several TC 5 experts (Hayashi, McInerney, Radasky and Savage) provided reviews for 12 HPEM papers submitted for the APEMC 2022 conference, now planned for Beijing in September 2022.

Further details can be found on this agenda item in the Attachment covering this agenda item.

5) **Report from the Lightning Subcommittee – Marcos Rubinstein and Farhad Rachidi**

A presentation audio/visual presentation was prepared by Marcos Rubinstein and Farhad Rachidi. Marcos prerecorded his voice while presenting the charts. It is noted that there were problems with our virtual attendees in hearing the presentation as the audio did not come from the system that was set up for the virtual attendees. The conferences and other events planned and held thus far in 2022 were presented along with the events planned for 2023. Also 9 WGs in CIGRE Study Committee C4 currently working were identified during the presentation. One WG in IEEE PES was also mentioned. In addition, other lightning activities were summarized. A workshop is planned for the 2023 IEEE EMC Symposium.

Further details can be found on this agenda item in the Attachment covering this agenda item.

6) **Report from the EM Information Leakage Subcommittee – Yuichi Hayashi**

Yuichi Hayashi provided his report beginning with an overview of the special session on Hardware Security for Smart Society in this year's conference. He also mentioned the activities that they have supported in the IEEE Digital Privacy Initiative. As for future plans, they are examining the possibility of having a special session or workshop on Supply Chain Security in 2023. Finally it was mentioned that from 20-24 May 2024, APEMC and Japan's EMC2024 will be combined in Okinawa, Japan so there will definitely be coverage of EM Information Leakage at this symposium. Of course all EMC researchers are welcome to submit papers and attend.

Further details can be found on this agenda item in the Attachment covering this agenda item.

7) **Report from the HEMP/IEMI Subcommittee – Mike McInerney**

Mike McInerney presented the HEMP/IEMI report in two parts. For the HEMP aspects, Bill Radasky provided a summary of activities (which have continued since 2021 including:

- The U.S. Department of Energy has published an open document to specify recommended HEMP waveforms to use to evaluate the vulnerability of the U.S. infrastructure. Many power companies are reacting to this development.
- The IEC updating IEC 61000-2-9 (HEMP radiated environment)

- The IEEE Power Energy Society is preparing a white paper dealing with the protection of protective relays from HEMP (to be published in 2024).
- CIGRE Study Committee C4 has a working group considering approaches to protect high voltage power control house electronics against HEMP
- Power companies are investigating ways to protect their electronics from HEMP (and IEMI)

With regard to the IEMI aspects Sven Fisahn reported on the 5 tutorials/special sessions presented on IEMI at the 2021 Glasgow virtual conference. He also mentioned a special session organized in Germany at the German forum for URSI in 2021. He also referred to the tutorial on HEMP and IEMI protection that was held on Monday of this conference.

Further details can be found on this agenda item in the Attachment covering this agenda item.

8) **Report from ESD Subcommittee – Shubhankar Marathe and Misha Khazhinsky**

Shubhankar Marathe presented the report from the ESD subcommittee. He discussed the paper exchange program between ESDA and the IEEE EMC Society. In particular the EOS/ESD Symposium scheduled for September 2022 has 3 invited papers from the EMC Society, and there will also be 4 seminars presented to the attendees.

Further details can be found on this agenda item in the Attachment covering this agenda item.

9) **Coordination with SC-1, Smart Grid – Mike McInerney**

McInerney introduced the activities of Special Committee 1 (Smart Grid), which is a coordinating committee, and he indicated that the SC 1 meeting had been held on Monday, with good attendance. It is noted that Mike McInerney is the Chairman of SC 1 and Bill Radasky continues in his role as Vice Chair and Dave Thomas is the Secretary. McInerney commented that TC 5 is keeping track of any issues involving Smart Grid and HPEM, and both the Chair and the Vice Chair of TC 5 have been attending the SC 1 meetings for many years.

10) **TC 5 web page – Mike McInerney, Vice Chairman**

Mike is continuing in his role as webmaster for TC 5. He is able to quickly update the website. He looks forward to comments from any members with regard to documents that could be placed on the site. In response to a question during this meeting about the scopes of the various subcommittees of TC 5, Mike mentioned that it is all on the website. The webpage for TC 5 can be found at: https://www.emcs.org/tc-5-high-power-electromagnetics.html

11) **Review of HPEM activities since last TC 5 virtual meeting in Glasgow – All**

Due to a lack of time, there was no detailed discussion concerning new developments in HPEM. McInerney asked that any new documents of a public nature be sent to him to post on our website.

12) **TC 5 Tutorials/Special Sessions planned at the EMC 2023, Grand Rapids**

Based on the presentations provided at this meeting from the subcommittees, it appears that several workshops/tutorials or special sessions will be proposed. One of the difficulties in predicting exactly which proposals will be made, is that given the "ending" of Covid restrictions in most places of the world, many conferences will be restarting, and our subcommittee members work with many conferences. It is expected that in the December time frame, new proposals will be due, and the Chairman, Bill Radasky, will remind the subcommittee chairs to identify their plans for the 2023 conference. Also it is important that all proposals be coordinated with the management of TC 5 in order to ensure the proper endorsements are made.

13) **Discussion of Standardization Activities**

After many years of discussion concerning the need for a new IEEE standard dealing with the effects on electronics when an aircraft is struck by lightning, a new PAR 28.38 has been approved. It is titled, "Aircraft Component Lightning Strike Direct Effects Qualification." Fred Heather mentioned that he is still looking for more experts to join the WG, and he expects to organize a meeting in the coming months.

A second topic was raised before the meeting by Tim Cash in an email to Bill Radasky. Tim was concerned that the new 5G transmitters may not be properly protected from lightning and that a new standard may be needed. He wanted to recommend that the IEEE EMC Society begin such an effort. There was discussion about whether cellular towers were so different that the existing lightning grounding procedures were not adequate. This question was not easy to answer, as there was no one in the room that was familiar with the current lightning "standards" for existing cellular towers. There was a statement from the floor, that it was clear that any existing standards had not been written by the EMC Society. It was more likely to be written by a lightning protection organization. The management of TC 5 will investigate what lightning protection standard exists for 4G and which organization has written the standard.

There was a third standardization activity mentioned by Andrew Podgorski. He recommended that TC 5 sponsor activity in writing an IEEE standard (or standards) to protect the critical infrastructures. Bill Radasky mentioned that the IEC has already written 22 standards and reports dealing with HEMP/IEMI and protection (including the critical infrastructures), and that there is an agreement at the highest levels between the IEEE and the IEC to not duplicate each other's standards. So it would be difficult to start a new IEEE standard without violating this agreement.

14) **Election of TC 5 Officers for 3-year Term**

The current officers of TC 5 are serving a 3-year term that ends on 31 December 2022 and therefore a new election must be held (announced in the agenda). Bill Radasky and Mike McInerney announced that they were willing to stand for re-election for a new 3-year term for Chairman and Vice-Chairman, respectively. Pina Dall' Armi-Stoks, the current Secretary was not present in the meeting or on the virtual link. Additional nominations for Chair and Vice-Chair were requested and none were made. A volunteer for Secretary was received by Yuichi Hayashi. No other volunteers or nominations were made.

Fred Heather moved that the 3 nominees be voted on as a "slate", and this motion was seconded and voted positively. The nominees then left the room, and Frank Sabath organized the voting process for the slate. After the nominees returned to the room, he informed the slate that they had been elected for 3 more years (1 January 2023 – 31 December 2025).

15) **Any other business - All**

Dr. Dave Giri has been selected for this year's IEEE EMC Society Hall of Fame Award, which will be presented on Thursday at the Awards Luncheon. Those of us who have worked in the HPEM area for many years know Dave and his excellent work. We in TC 5 wish to add our congratulations. As Dave did not attend the TC 5 meeting, Bill Radasky said that he would pass our congratulations to him at the Award's Luncheon.

16) **Adjournment**

The meeting was adjourned at 1:30 PM.

Attachments (labeled with agenda item)

2-Approved Glasgow Minutes
4-Report on Paper Review Process
5-Lightning Subcommittee Report
6-EM Information Leakage Subcommittee Report
7-HEMP/IEMI Subcommittee Report
8-ESD Subcommittee Report

2023 TC 5 Attendance List	Updated: 2 August 2023						
		New Orleans	Reno-Virtual	Glasgow-Virtual	Spokane	Grand Rapids	
Name	Affiliation	2019	2020	2021	2022	2023	Email Address
Rami Amin	?		X				
Mariya Antyufeyeva	?		X				
Carlos Aviles	USAF					X	
Dr. Daryl Beetner	Missouri University of Science and Technology	X		X			
Dr. Tyler Bowman	Sandia National Laboratories	X		X	X	X	
Dr. Felix Burghardt	Leibniz University, Hannover, Germany	X	X				
Tim Cash	Baltimore EMC Society		X				
Paul Clem	Boeing					X	
Larry Cohen	Consultant					X	
Dan Donato	?		X				
Dominico Festa	IBD				X		
Sven Fisahn	Bundeswehr Research Institute, Germany	X	X	X	V		
Dr. Ali Foudazi	Amazon Lab126				*	V	
Ryan From	Boeing	X					
Dr. Heyno Garbe	Leibniz University, Hannover, Germany	X		X		V	
Matt Halligan	Sandia National Laboratories	X	X				
Ed Hare	AARL		X	X			
Aaron Harmon	MST EMC Lab					X	
Dr. Yu-ichi Hayashi	Tohoku University, Japan	X			X	X	
Fred Heather	USN	X		X	X	X	
Prof. Kengo Iokibe	Okayama University, Japan	X					
Tom Jarse	Boeing				X	X	
Randy J. Jost	Utah State University					X	
Dr. Michael Khazhinsky	Silicon Labs and ESDA	X	X				
Jong Hwa Kwon	ETRI				X	X	
Matt Lara	APELC				X		
Dr. Frank Leferink	Thales, Univ of Twente, Netherlands	X	X	X			
Dr. Sergio Longoria	ETS-Lindgren					X	
Jim Lukash	Lockheed Martin		X		X		
Shubhankar Marathe	Amazon Lab126		X	X	X	X	
Mike McInerney	USACE-ERDC	X	X	X	X	X	
Don McPherson	SRC, Inc.		X				
Kingsley McRae	EMC Society Australia	X					
Monrad Monsen	Oracle		X				
Dr. Nicolas Mora	Technology and Innovation Institute, Abu Dhabi	X	X	X	X		
Prof. Petre-Marian Nicolae	University of Craiova, Romania	X					
Mike Oliver	MAJR Products Corp.					X	
Dr. Michal Pietrzyk	Thysseukrupp Marine Systems					X	
Dr. Andrew Podgorski	Consultant		X	X	V		
Valter Mariani Primian	UNIVPM, Ancona, Italy		X				
Prof. Farhad Rachidi	Swiss Federal Institute of Technology	X	X				
Dr. William Radasky	Metatech	X	X	X	X	X	
Dr. Marcos Rubinstein	Univ. of Applied Science, Switzerland	X	X				
Dr. Frank Sabath	Bundeswehr Research Institute, Germany			X	X	X	
Dr. Luis San Martin	Sandia National Laboratories	X					

Dr. Edward Savage	Metatech				X		
Martin Schaarschmidt	Bundeswehr Research Institute, Germany			X	X		
Melissa Schwager	Ford Motor Company		X				
Harry Skinner	Intel				X		
Hywel Sollis	UK Ministry of Defence				X		
Abtin Spantman	AETANT	X	X				
Dr. Adrian Sun	Aerospace Corporation			X		X	
Kin Sze	National Defence QETE, Canada	X		X		X	
Dr. Joost Willemen	Infineon Technology, Germany	X	X	X			
Ali Yaqoob	Technology and Innovation Institute, Abu Dhabi						
Jong-Gwan Yook	Yonsei University				X		
Names not available on WEBEX			4X				
Corresponding Members							
Dr. Harald Gossner	Intel						
Joe P. Huynh	Boeing/BR&T						
Phil Johns	Johns Hopkins APL						
		23	29	17	20	21	

2023 IEEE EMC Society TC 5 Paper Review Process and Tutorials, Special and Regular Sessions

Prepared by

Bill Radasky, TC 5 Chair

2 August 2023

TC5

Paper Review Process

- We reviewed 10 regular papers and 5 abstract papers
  - All regular and abstract papers were accepted after comments
- The reviewers did a great job
  - Homma, Khazhinsky, McInerney, Sabath, Savage, Thomas, Willemen
- Reviews were summarized by the Chair under the current procedures (cut and paste process)
- Some software problems continued with the notification of the assigned reviews, which caused some minor delays. Also the software did not allow a long session to be broken up into session blocks with different session chairs (this was never a problem with the old manual system).

Paper Session Organization

- One “Session” has been organized in 4 parts on Thursday, 3 August in Overlook D, from 8:00 AM - 5:30 PM. There are 4 groupings of papers
  - HEMP Effects and Propagation (8:00 - 10:00 AM)
  - EM Information Leakage (10:30 AM - 12:30 PM)
  - IEMI Effects (2:00 - 3:30 PM)
  - ESD and Power Transfer (4:00 - 5:30 PM)
- There is one TC 5 paper in the poster session, which is to be held on Wednesday afternoon in the Exhibit Hall from 1:30 - 3:30 PM
  - “Failure Mechanisms Analysis in GaN HEMTs under High-Power Microwave Pulses,” Yue Zhang, Liang Zhou

Special Sessions

- No special sessions were organized this year

Tutorial

- WE-PM-G: Wednesday, 2 August 2023, 1:30 - 6:00 PM
  - "Recent Advancements in HEMP, EMP, and IEMI Protection – A Global Perspective"
  - Organizers: Tara Kellogg and Chaouki Kasmi
  - Presentations by: Chaouki Kasmi, Sergio Longoria, Ryan Marietta, Frank Sabath
- This tutorial will be held today immediately after this TC 5 Meeting

Best Paper Nominations

- Three TC 5 papers were nominated for Best Paper
  - Best EMC Paper Finalist: "Early-time Electromagnetic Pulse Response Validation of Surge Arrester Models," by Tyler Bowman, Thomas Kmieciak, Laura Biedermann
  - Best EMC Paper and Best EMC Student Paper Finalist: "Reconstruction of Sound Information Leakage Signals Obtained from Multiple Demodulation Methods," Taiki Kitazawa, Seiya Takano, Yuichi Hayashi
  - Best EMC Student Paper Finalist: "Failure Mechanisms Analysis in GaN HEMTs under High-Power Microwave Pulses," Yue Zhang, Liang Zhou
- Awards will be announced at the Thursday Luncheon

2024 Conference Plans

- As usual we will review the submitted regular papers, abstract papers, and also any special session papers that may be organized for the Phoenix IEEE EMC Conference from 29 July - 2 August
- From 20-24 May, the EMC Japan/APEMC Conference will be held in Okinawa
  - TC 5 will support the paper reviews as in the past
  - TC 5 will consider organizing a TC 5 meeting to provide a convenient location for EMC engineers in Asia
- GlobalEM will be organized in Austin, Texas during the summer of 2024
  - TC 5 will support the paper reviews as in the past

TC-5 Meeting, Grand Rapids 2023

Report on Lightning Activities

M. Rubinstein
F. Rachidi

Main Events with Lightning Related Content in 2023

- AMS Annual meeting. Jan 8-12, Denver, USA
- IEEE EMC & SIPI, Jul 31-Aug 4, Grand Rapids, Michigan, USA
- URSI GASS 2023. Aug 19-26, Sapporo, Hokkaido, Japan
- EMC Europe 2023. Sep 4-8, Krakow, Poland
- CIGRE ICLPS/SIPDA. October 9-13, Suzhou, China
- APEMC. May 22-25, Bengaluru, India
- AGU Fall Meeting. Dec 11-15, San Francisco, USA

Main Events with Lightning Related Content in 2024

- URSI AT-AP-RASC, 19-24 May, Gran Canaria, Spain
- APEMC. 20-24 May, Okinawa, Japan
- IEEE EMC & SIPI. 29 July- 2 August, Phoenix, AZ
- ICLP, 1-7 September, Dresden, Germany
- EMC Europe. 2-5 September, Bruges, Belgium
- ICOLSE, 9-12 September, Sao Paolo, Brazil
- GlobalEM. Dates to be announced, Austin, TX, USA

CIGRE Working Groups on Lightning

- WG C4.57, “Guidelines for the Estimation of Overhead Distribution Line Lightning Performance and its Application to Lightning Protection Design”, Convenor: Koji Michishita (JAPAN)
- WG C4.59, “Real-time Lightning Protection of the Electricity Supply Systems of the Future”, Chair: Chong Tong (China)
- WG C4.61, “Lightning transient sensing, monitoring and application in electric power systems”, Chair: Jingliang He (China)
- WG 4.66. “New concept for analysis of multiphase back-flashover phenomena of overhead transmission lines due to lightning”, Megumu Miki (Japan)
- WG4.67, Lightning Protection of Hybrid Overhead Lines, Alexandre Piantini, Brazil.
- WG C4.69, “Quantifying the lightning response of tower-footing electrodes of overhead transmission lines_methods of measurement”. Convener: Silverio Visacro (Brazil)
- WG C4.70, Jan 2022-, “Application of space-based lightning detection in power systems”, Convenor: Joan Montanyà (Spain)
- JWG C4_B4.72, “Lightning and Switching Induced Electromagnetic Compatibility (EMC) issues in DC power systems and new emerging power electronics-based DC equipment”, Convenor: Qingmin Li (China)
- JWG B2_C4.76, “Lightning & Grounding Considerations for Overhead Line Rebuilding and Refurbishing Projects, AC and DC”, Convener: William A. Chisholm (CA)

Other Working Groups

- IEEE PES Lightning Performance of Overhead Lines Working Group
  - This year, meeting held July 16 – 29 in Orlando, FL.
  - Next year's annual meeting will be held in conjunction with the 2024 IEEE PES GM (which will be held in 21–25 July in Seattle, Washington).

This year's activities

- Keynote at GROUND conference in Brazil on May 9: "Guiding Lightning with High-Power Lasers: Experiments at the Säntis Tower in Switzerland".
- Organized a session on Lightning and Related Effects to be held at the end of August during URSI GASS in Sapporo.
- Taught an advanced Ph.D. level course on lightning physics and measurements
- Added a Gamma Ray detector belonging to Jakub Šlegl to the measurement devices at the Säntis Tower. Installation of X-Ray detector is underway.

Proposed work for 2024

- Contributions to the 2024 events with lightning content
- National workshop on lightning and its incidence to tall structures

2 August 2023

IEEE EMC Society TC5 Subcommittee: Electromagnetic Information Leakage

Yuichi Hayashi

Regular Session in IEEE EMC + SIPI 2023

TH-ALL-D TECHNICAL PAPERS • Sponsored by TC-5

Chair: William Radasky (Metatech Corporation, Goleta, CA, USA)

The number of papers: 5 papers (Related to EM information leakage)

1. Reconstruction of Sound Information Leakage Signals Obtained from Multiple Demodulation Methods
2. Detecting Hardware Trojans on Inter-IC Serial Data Links through Capacitance Sensors
3. Fundamental Study on the Effect of the Duty Ratio of Clock Signal on Side-Channel Leakage
4. Enhanced Modulation Degree of Leakage Wave Induced by IEMI via Nonlinear Circuit Elements
5. Coupling Path Analysis for Smart Speaker Intentional Electromagnetic Interference Attacks

Special Sessions in EMC Europe 2023

SS-01: Physical Layer Security and Hardware Supply Chain Security: EM tricks keep your information and devices safe

Session Organizers: Yuichi Hayashi (Nara Institute of Science and Technology, Japan) and Frank Leferink (University of Twente/THALES, Netherlands)

The number of papers: 8 **papers**

1. Introduction to Physical Layer Security and Hardware Supply Chain Security: EM Tricks to Keep Your Information and Devices Safe
2. An Introduction to TEMPEST (Classified), using ChatGPT
3. TEMPEST Demo for Increasing Awareness
4. Evaluation of Impact of Differential Transfer Efficiency of EM Leakage on Screen Reconstruction against High-Resolution Displays
5. Intrusion Detection and Shielding Measurements using Signals of Opportunity
6. Counter-TEMPEST: Information Spoofing based on the EM-leakage Signature of TMDS system
7. Prediction Accuracy Improvement of Side-channel Information Leakage by Using EM-Circuit Co-simulation of PDN with Filters
8. Hardware Supply Chain Security and EM Tricks

Workshop in EMC Europe 2023

WS-09A: TEMPEST - Compromising Emanations, Side-Channel Attacks -

Session Organizers: Frank Leferink (University of Twente/THALES, Netherlands)
and Yuichi Hayashi (Nara Institute of Science and Technology, Japan)

The number of papers: 5 **talks**

Abstract : TEMPEST is a codename referring to spying on information systems through leaking emanations like unintentional radio, or electrical signals, emission. TEMPEST covers both methods to spy upon others and how to shield equipment against such spying. The protection efforts for TEMPEST are also known as emission security (EMSEC). It is not limited to defense systems, or systems processing classified information; as our living society becomes more deeply entrenched with a wide variety of information devices that are processing private information, the need for protecting the emission of unwanted signals increases. Reported targets of information leakage include information on the screen of a monitor, keystroke information from tablets and smartphones, keystroke information from the keyboard, data being processed inside a CPU, and secret information inside devices that perform encryption processing. Among these threats, the threats mainly targeting cryptographic modules are called "side-channel attacks." These take into consideration leakage channels such as not only electromagnetic emission but also power consumption, sound, fan rotation speed, LED flickering, etc. In this workshop, we'll provide an overview of these threats and discuss current research activities related to them.

Activities in IEEE Digital Privacy Initiative

IEEE Digital Privacy

- Framework and Foundation
- Policies and Legislations
- Conferences and Workshops
- Education and Training
- Publications
- Standards
- Connected Vehicles Industry
- Healthcare Industry
- Energy Industry

The IEEE Digital Privacy Initiative was approved under IEEE Future Directions in January 2022 as an IEEE-wide effort dedicated to champion digital privacy for individuals. The Initiative advocates a user centric perspective – focusing on the digital privacy needs of the individuals rather than the security of data, products, and organizations – such as empowering individuals with user-enabled privacy controls and promoting privacy at the outset of product and service lifecycles.

Participating IEEE OUs

IEEE Biometrics Council; IEEE Computational Intelligence Society; IEEE CTSoc Consumer Technology Society; IEEE Educational Activities; EMC Society; IEEE Electronics Packaging Society; EMB Engineering in Medicine and Biology Society; IEEE PES Power & Energy Society; IEEE Reliability Society; IEEE SSIT Society on Social Implications of Technology; IEEE SA Standards Association; IEEE Systems Council; IEEE SMC Systems, Man, and Cybernetics Society; IEEE VTS Connecting the Mobile World

IEEE Kansai MDC Special Lecture / 118th IEEE Kansai Section Technical Lecture Meeting

Who is making the decisions about our Digital Privacy?

Abstract: With the acceleration of digital age services, many of us may have hurried to accept features providing thrilling convenience and luxuries for our daily lives. The scope of data contained within our handheld devices often is assumed to be within our control, but such an assumption may not be reality. In this session we explore several topics around the tenacity of our digital privacy. We will examine some of the rapid evolutions in technology related to how they may impact an individual expectation of digital privacy. In many cases decision regarding privacy is made with unrelative awareness, and by people who may not be qualified to make those decision, nor who are aware of the passing of such a decision point. People who are making organizational decision regarding policies for privacy, those developing security application, or those managing customer facing products will value from this analytical discussion on where, when who is making decisions about aspects of our Digital Privacy.

Christopher Gorog

CEO BlockFrame Inc, Chair IEEE Digital Privacy Initiative, Chair IEEE Blockchain Initiative Security & Privacy, Published Author, Inventor, Co-Founder of Blockchain Development Community, Founder of International Alliance of Trust Chains, Blockchain SME to the State of Colorado Legislator, the Host of the New Cyber Frontier Podcast, and Research Partner with Pacific Northwest National Laboratory, Arizona State University, University of Colorado, University of Denver, and Colorado State University.

Mr. Gorog is a Certified Information Systems Security Professional by the International Information System Security Certification Consortium and Certified Project Management Professional by the Project Management Institute and has over 25 years in industry designing cryptographic applications for cyber physical embedded systems and has worked to secure supply chains for several leading manufacturers.

He is an ex-Navy Nuclear Engineer, who has also spent several years in Academia as a Director for Cybersecurity programs at Colorado Technical University. He holds a bachelor's degree in Computer Engineering, Master of Business Administration, Master of Computer Science in Computer System Security from Colorado Technical University. His PhD work in Cybersecurity Engineering at University of Colorado at Colorado Springs, engages several community groups and international organizations in support of research for the State of Colorado to enable security and privacy for government records.

EMC Japan/APEMC Okinawa

The 2024 IEEE Joint International Symposium on Electromagnetic Compatibility, Signal & Power Integrity: EMC Japan/Asia–Pacific International Symposium on Electromagnetic Compatibility

Okinawa Convention Center (Ginowan), Okinawa, Japan

May 20-24, 2024

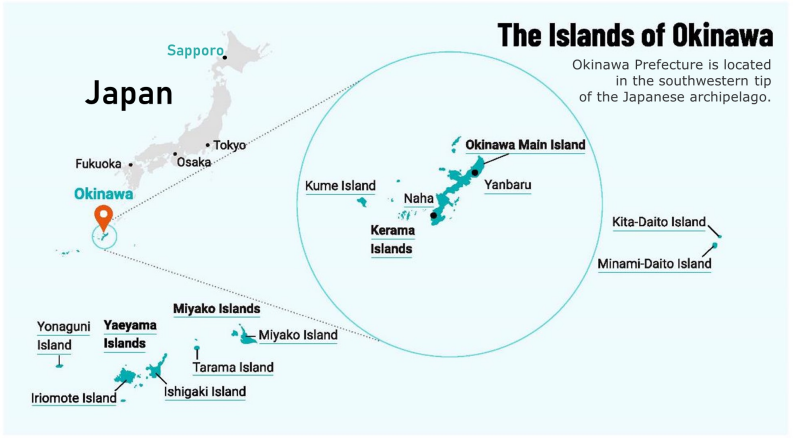
EMC Japan / APEMC Okinawa May 20-24, 2024

IEICE Communications Society

IEEE

EMC SOCIETY

APEMC



Important Dates

Special Session Proposal Deadline: **Sep. 15, 2023**

Workshop & Tutorial Session Proposal Deadline: **Oct. 16, 2023**

Paper (Regular/Special) Submission Deadline: **Nov. 30, 2023**

EMC+SIPI 2023 GRAND RAPIDS, MICHIGAN JULY 31-AUGUST 4

2023 IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY, SIGNAL & POWER INTEGRITY

WWW.EMC2023.ORG • #IEEE_ESP23

Outreach activity in future

To promote the field of information leakage, we would like to have workshop/special sessions in future EMC symposiums.

Special session in EMC Japan/APEMC Okinawa (May 20-24, 2024, Okinawa, Japan)
Workshop/Tutorial Session in IEEE Symposium on EMC, SI & PI 2024

HEMP/IEMI Subcommittee Report to TC 5 (HPEM)

Mike McInerney

2 August 2023

TC5 HEMP / IEMI Subcommittee

- Created in 2020 to improve the organization of the website and ease subcommittee reporting
  - HEMP information had been placed only in meeting minutes, while other subcommittees placed relevant information on their respective sub-pages on the website
  - Since parts of HEMP and IEMI have similar fast rising time waveforms and are high power EM, they are associated
  - HEMP (and IEMI) literature is now listed on the HEMP / IEMI web page
  - Mike McInerney volunteered to be the General POC for the new HEMP / IEMI subcommittee
  - Bill Radasky volunteered to be the POC for the new HEMP subcommittee
  - Frank Sabath retired from his role as POC for the IEMI subcommittee, and Sven Fisahn took over

TC5 HEMP / IEMI Subcommittee

- We encourage all TC5 committee members to submit information on TC5 related activities to subcommittee POCs
  - Lightning
  - EM (Information) Leakage
  - HEMP / IEMI
  - ESD

Recent HEMP Activities

Report from the TC5 Subcommittee on HEMP
Compiled by William Radasky
26 July 2023

Recent HEMP Activities

- Several important HEMP activities have continued since our last conference and TC5 meeting in 2022
  1. The IEC is updating IEC 61000-2-9 (HEMP environment) and IEC 61000-5-6 (Mitigation of external EM influences)
  2. The IEEE PES White Paper effort has stalled with no progress for over 1 year
  3. CIGRE Study Committee C4 has a working group considering approaches to protect high voltage power control house electronics against HEMP
  4. Power companies are investigating ways to protect their electronics from HEMP (and IEMI)
  5. GlobalEM is the new name for the old AMEREM/EUROEM/ASIAEM series of HPEM conferences. A 1-week workshop and conference was held in Abu Dhabi, UAE from 7-17 November 2022. The next GlobalEM Conference is scheduled for the Summer of 2024 in Austin, TX
- Items 1and 4 are discussed in more detail in the following two charts

IEC 61000-2-9 Update Plans - 1

- IEC Subcommittee 77C has started maintenance on its body of both IEMI and HEMP publications
  - Several HEMP and IEMI publications are being updated
- For the HEMP radiated environment, there are several areas of IEC 61000-2-9 that have been discussed for more than 2 years to improve the standard
- The maintenance work for IEC 61000-2-9 is underway
  - Project Leader: Dr. William Radasky
  - Document has been circulated as a Committee Draft (CD) and will be discussed in Cairo, Egypt in October 2023
  - Summary of improvements are on the next chart

IEC 61000-2-9 Update Plans - 2

- Key improvements being evaluated
  - Provide information for the variation of the E1 and E3 HEMP fields as a function of position. This will include sample ground contour plots and/or range dependent variations for the peak values and the pulse shapes for E1 HEMP.
  - Add additional analytic E1 HEMP waveforms with different rise times and pulse widths.
  - Provide new analytic E3 HEMP waveforms (both B- and E-fields) based on new openly published information from the U.S. EMP Commission.
  - Provide information on how to compute the E3 E-field from the incident B-field and provide a few ground conductivity profiles for those calculations.
  - Provide an annex that shows an equivalent QEXP (Quotient of Exponentials) waveform that is more accurate above 100 MHz for the E1 HEMP waveform. This will help those who try to extend the DEXP (Difference of Exponentials) waveform in the frequency domain to frequencies well above 1 GHz.
  - Explain in another annex why the E1 HEMP waveform in time does not require a "zero area". This has caused a great deal of confusion regarding the way the E1 HEMP waveform is specified.

Power Company Activities

- Over the past 3 years several power companies are evaluating the shielding effectiveness of their existing transmission substation buildings
- One company has upgraded a current metal building design to improve its shielding effectiveness
  - Screen mesh windows
  - Shielded yard cables and/or the use of fiber optics
  - Better external cable bonding before entry
  - Testing before and after changes to demonstrate the effectiveness of improvements
- Many of the improvements in protection are based on papers from IEEE EMC Conferences and IEC standards

Recent IEMI Activities

Report from the TC5 Subcommittee IEMI
Compiled by Sven Fisahn
31 July 2023

Recent IEMI Activities

- 2022 IEEE International Symposium on Electromagnetic Compatibility, Signal & Power Integrity (EMC+SIPI 2022 Spokane)
  - Tutorial chaired by F. Sabath and D. Giri: “Recent Advancements in HEMP, EMP and IEMI Protection – A global perspective”
  - Workshop chaired by M. Kopf and G. Bastian: “Risk-Based EMC Initiatives in Europe”,
    Contribution “Systematic Analysis of EMI Risks” by Frank Sabath
- International Symposium and Exhibition on Electromagnetic Compatibility 2022
  (EMC Europe 2022 Gothenburg)
  - Workshop chaired by Nandun Senevirathna: “Risk-Based EMC Implementation”,
    Contribution “Systematic Analysis of EMI Risks”, by Frank Sabath

ESD Update

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TC-5 (HPEM) Meeting

August 2, 2023

ESD Technical Exchange – 2023 Updates

- The 2023 EOS/ESD Symposium again has a special focus on EMC and system-level related topics.
  - 2 Sessions with 5 papers
    - 2 EMC Society exchanges
    - 2 Accepted
    - 1 German Forum exchange

- Paper exchange program between IEEE EMC+SIPI Symposium and ESDA continues in 2023.
  - Two papers from 2022 EMC+SIPI Symposium are presented as invited papers at the 2023 EOS/ESD Symposium.
    - Modeling an ESD Gun Discharge to a USB Cable Analysis Of CPU Loading Effect On ESD Susceptibility
    - Measurement of Current Waveform Due to Different Load of ESD Gun, TLP-HMM, and CR-HMM

ESD Standards – 2023 Updates

- 10 ESD standard documents have been published:
  - ANSI/ESD S20.20 – ESD Control Program Requirements Redline Version
  - ANSI/ESD S20.20 – ESD Control Program Requirements Commented Version
  - ANSI/ESD S20.20 – ESD Control Program Requirements Five Translations
  - ANSI/ESD STM5.5.1-2022 – Transmission Line Pulse
  - ANSI/ESD STM11.11-2022 - Surface Resistance Measurement of Planar Materials
  - ANSI/ESDA/JEDEC JS-002-2022 – Charged Device Model (CDM)
  - ESD TR5.5-04-22 – TLP User Guide
  - ANSI/ESD SP5.3.4-2022 - Capacitively Coupled Transmission Line Pulsing (CC-TLP) as an Alternative CDM Characterization Method
  - ANSI/ESD SP5.4.1-2022 - Transient Latch-up Testing
  - ESDA/JEDEC JTR002-01-22 – User Guide for ANSI/ESDA/JEDEC JS-002
  - ANSI/ESD S11.4-2022 - Bags
  - ANSI/ESD SP5.1.3-2022 - Method for Randomly Selecting Pin Pairs
  - ANSI/ESDA/JEDEC JS-001-2023 – Human Body Model (HBM)
  - ESD TR7.0-01-23 – Flooring Systems
- Upcoming document releases:
  - ESD TR5.5-04-23 – TLP User Guide
  - ANSI/ESD SP5.0-2023 - Datasheets
  - ANSI/ESD S20.20 – ESD Control Program Requirements - 2 Translations

Tutorial Proposal for 2024: IEC Standards for HEMP/IEMI

Bill Radasky

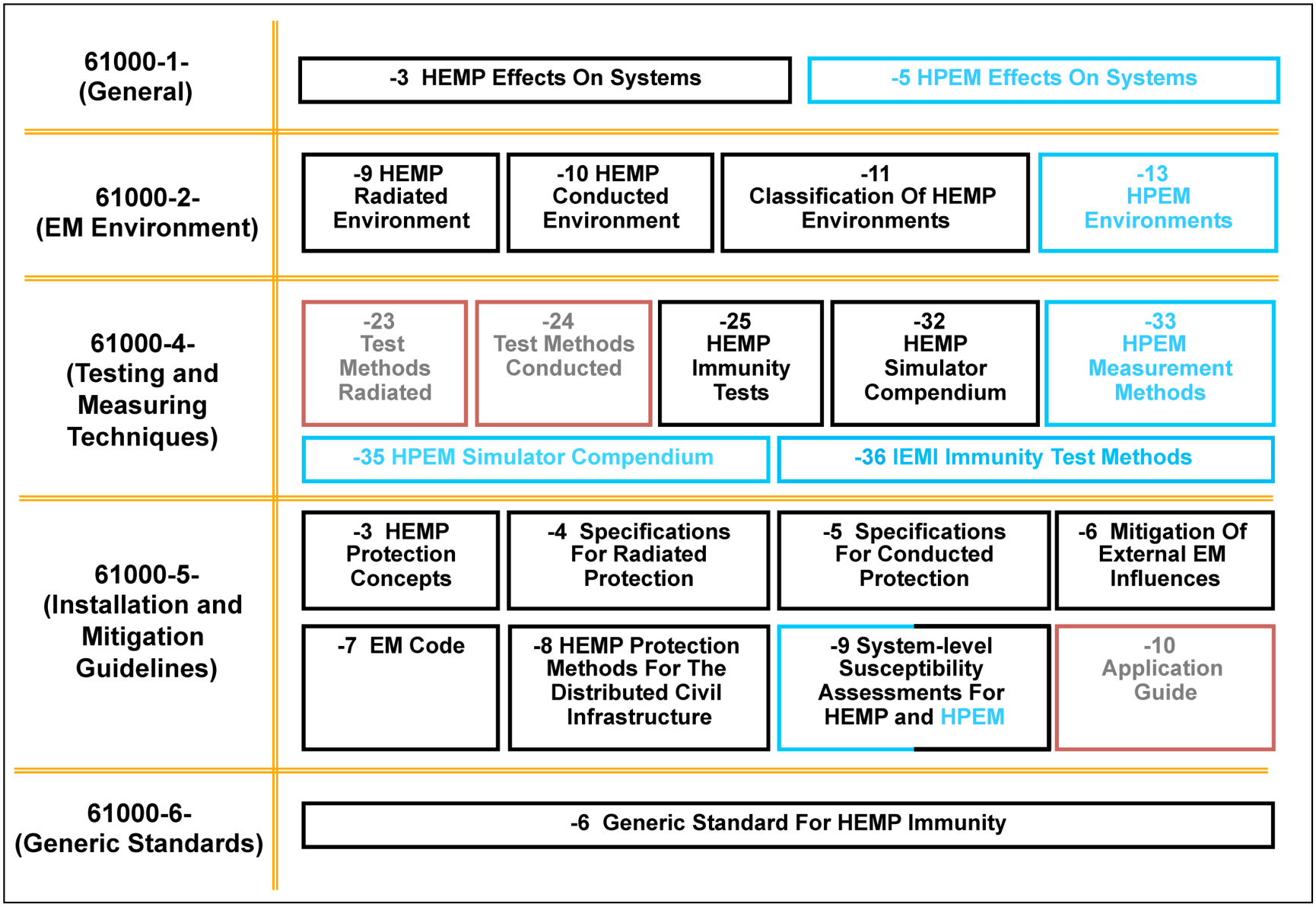
2 August 2023

TC5

Rationale

- Significant effort is being directed in many countries to protect the critical infrastructures from the threats of HEMP and IEMI
- The organization that has produced the most significant commercial standards on the levels of the threats and suitable test and protection methods is the International Electrotechnical Commission (IEC)
  - These standards are based on traditional EMC protection methods including shielding and surge arresters/filters but emphasize time domain methods
  - Work started in 1989 and is continuing with updates to the standards based on open publications
- There is a need to update the EMC community with the situation regarding HPEM threats and protection methods

Overview of IEC Publications



Recommended Topics

- Status of the IEC HEMP/IEMI environment standards and how they can affect commercial systems
- Review of the test methods and their applicability
- Review of the recommended assessment methods, the protection methods, and the application guide
- How to apply the HEMP generic standard for equipment inside of buildings
- How the IEC SC 77C standards are being applied today

Note that the emphasis is on commercial, not military standards. These differences will be discussed.

Potential Speakers

- Engineers who have actively worked on the IEC publications and have helped to write them, will be the speakers
- Potential Speakers
  - William Radasky, US
  - Richard Hoad, UK
  - Edl Schamiloglu, US
  - Tae Heon Jang, KR
  - Sergio Longoria, US