

Final Program

68th IEEE Holm Conference on Electrical Contacts



4-11 OCTOBER 2023
Hyatt Olive 8
Seattle, Washington, USA



IEEE



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2023 Awards Committee

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Open Position

Purpose

To provide a forum for the presentation and discussion of the latest developments in the field of electrical contacts, as well as the application of recent advances in materials and processes in electrical, electronic and telecommunications equipment.

For Whom

Practicing designers, engineers, physicists, and research scientists—those new to the field and those experienced. The 2023 IEEE Holm Conference will include excellent papers. These papers are authored by outstanding contributors in this field from around the world, including the USA, China, France, Germany, Japan, Mexico, and the United Kingdom. These papers will provide the attendees with up-to-date information on a wide range of subjects that makes this conference so attractive to the practicing engineer.

Background

The Holm Conference began in 1953 as a forum for the discussion of electrical contact phenomena and related fields. In 1968, the conference was named the Holm Seminar in honor of Dr. Ragnar Holm, whose contributions to the field of electrical contacts spanned 50 years and forms the foundation of the electrical contacts field, was the inspiration and guide of the Conference from its inception until his death in 1970.

In addition to the Annual Conference, the Conference Organization regularly conducts an intensive course on contacts and participates in the biannual International Conference on Electrical Contacts.

Registration

All participants are encouraged to pre-register to avoid lines at the conference and to obtain the discounted fee.

CONFERENCE REGISTRATION

	On/Before 7/1/2023	After 7/1/2023
IEEE Member	US\$850	US\$925
Non- Member	US\$925	US\$1000
IEEE Student or Life Member	US\$300	US\$340
Student Non-Member	US\$375	US\$425

CONFERENCE REGISTRATION HOURS

Sunday 8 October	4:00PM – 6:00PM
Monday 9 October	7:00AM – 5:00PM
Tuesday 10 October	7:30AM – 5:00PM
Wednesday 11 October	8:00AM – 12:00PM

Registration can be completed online:
<https://ieee-holm.org/registration/>

Registration payments:

Checks are to be made out to the IEEE HOLM in US\$. Visa, MasterCard, Discover, and American Express are accepted.

For additional information please contact Holm Registrar, at:

US and Canada: +1 800 810 4333
Elsewhere: +1 732 465
7810 Email:
holmreg@ieee.org

Event Location and Rooms

WELCOME RECEPTION

All conference attendees are invited to register early and to attend our welcome reception on Sunday, 8 October from 4:00 PM – 6:00 PM at the Hyatt at Olive 8. The hotel is located in scenic downtown Seattle within walking distance to Pike Place Market.

Hotel Accommodations

The 2023 Conference meets in Seattle, Washington at the Hyatt Olive 8, which has meeting facilities well suited to the conference sessions and other activities. The hotel is offering special rates of US\$274 single/double occupancy to conference attendees. Rates are subject to state and local tax. To make a reservation, please call the Hyatt Olive 8 directly at 1-206-695-1234 or use the Holm Conference link at

<https://www.hyatt.com/en-US/group-booking/SEAHS/G-EEEE>

Please refer to the Group Code as “G-EEEE” in order to receive the group rate.

The rate is valid until September 12, 2023 at 5:00PM EST. Reservations received after this date will be subject to space and availability. Cancellation policies may vary depending on the rate and dates of your reservation. Please refer to your reservation confirmation to verify your cancellation policy. If you need further assistance, call the hotel directly or contact customer service.

Check in time: 3:00PM

Check out time: 11:00 AM

The hotel address is:

Hyatt at Olive 8
1635 8th Avenue
Seattle, Washington 98101 USA
+1 (206) 695-1234

Transportation

Airport and Driving Directions:

FROM SEATTLE-TACOMA INTERNATIONAL AIRPORT – 26 MINUTES/14.2 MILES

Get on I-5 N in Tukwila from Air Cargo Road and WA-518 E. Continue on I-5 N to Seattle. Take exit 164A from I-5 N. Drive to 8th Avenue.

For more information regarding the venue location, see

<https://ieee-holm.org/venue/>

or call the Hyatt Olive 8 directly at +1 (206) 695-1234.

Conference Banquet

9 October 2023
6:00PM

The IEEE Holm Banquet will be held in the Main Ballroom of the Hyatt at Olive 8.

This event will feature the **West Event Band**, a dynamic ensemble known for their musical prowess and unforgettable performances! Led by the mesmerizing vocals of Nik Singleton and piano wizard, Shawn Schlogel. They are joined by the maestro of bass, Greg Feingold, and the powerhouse drummer, Max Holmberg. A dance floor will be available for after dinner dancing for those wishing to do so.



Each conference attendee will receive a ticket to attend the Banquet. Additional tickets may be purchased for the rate of \$80 USD.

Holm Conference Ragnar Holm Scientific Achievement Award

The Ragnar Holm Scientific Achievement Award derives its significance and prestige from the scientist whose name it carries. The contributions of Dr. Ragnar Holm to electrical contact theory and application are renowned the world over. The award, created in 1971 by the Steering Committee of the Holm Conference, honors the memory of the founder of modern electrical contact science by recognizing outstanding scientists and engineers in the field of electrical contacts or related technologies.

2023 Ragnar Holm Scientific Achievement Awardee Xin Zhou



Xin Zhou (M'91–SM'03) received his B.S. degree from Tsinghua University, Beijing, in 1987, his M.S. and Ph.D. degrees in Mechanical Engineering from the University of Minnesota, Minneapolis, in 1991 and 1995, respectively. From 1995 to 1996, he was with Phoenix Solutions Company as a plasma technology

specialist responsible for developing and designing plasma torch systems for waste remediation. Dr. Zhou joined Eaton Research Labs in 1996 and he is currently a Senior Engineering Manager with the Protection, Control and Solutions group of Eaton.

His research focus area includes solid state and hybrid circuit breaker technology, arcing phenomena, next generation product development in power control and distribution, arc fault detection and arc flash mitigation, optical emission spectroscopy and plasma enhanced material processing. He is the recipient of the Eaton Innovation Award for both 2008 and 2010, the 2011 Eaton Engineer of the Year Award and the 2023 Eaton's SASE Technical/Research/Business Achievement Award. He is the inventor or co-inventor of 105 US patents (issued) and patent applications (pending). Dr. Zhou also authored or co-authored over 44 journal and conference papers as well as book chapters.

He is a senior member of IEEE and a member of the IEEE Holm Conference Steering Committee and Technical Programs Committee. Dr. Zhou has been actively participating in IEEE Holm Conference since 1991. He has served as conference chair, technical program chair or member of various committees of the IEEE Holm Conference. Dr. Zhou is an associate editor for the IEEE Transactions on Components, Packaging and Manufacturing Technology. He is currently a member of USNC Advisory Group to IEC SC 121A PT 60947-10 (Power Electronic Circuit Breakers).

Dr. Zhou is a recipient of the 1991-1992 IEEE-CHMT Graduate Fellowship Award for Research on Electric Contacts, the 1993, the 2003, the 2011 and the 2013 IEEE Erle Shobert Prize Paper Awards, and the 2014 IEEE Armington Recognition Award.

Holm Conference Ragnar Holm Scientific Achievement Award Nomination Guidelines

History: The Ragnar Holm Scientific Achievement Award was created by the 1971 Holm Conference Steering Committee in honor of the memory of Dr. Ragnar Holm, the founder of the modern science of electrical contacts. This award is to be granted to a living scientist or engineer who has made significant contributions to the theory or practice of electrical contacts, or for work in related technologies which is directly applicable to contacts. In considering a person's work and selecting a recipient preference will be given for: a.) Nominees that have made contributions to the technology over many years, b.) the originality and scientific importance of contributions, and c.) achievements that have found a high degree of practice. Provided worthy candidates are found, the Award will be granted annually.

Eligibility: Any person may be nominated for this award regardless of IEEE membership. Members of IEEE Holm Awards Committee are not eligible to be considered for the award while serving on this committee. Nominations are not accepted for persons deceased. Candidates must have made contributions to the electrical contact field for a period spanning at least ten years.

Nominator Eligibility: Any person may nominate a candidate for this award, with the following exception: members of the award committee.

Nomination Support Materials Endorsers:

At least two letters of endorsement are required. One is from the nominator and the others are from the endorsers selected by the nominator. Endorsers should be in a position to substantiate the candidate's contributions by providing explicit detail from personal knowledge. The nominator is responsible for submission of the letters of endorsement.

Candidate Personal Data/Education/Work:

"Name", provide complete name of candidate, not initials. "Personal", provide date of birth, and citizenship. "Education", list year and exact degree of each institution. "Society Membership", list various professional society affiliations. Under society activities list officer and major committee work. "Professional History", list present occupation followed by previous career experiences. Indicate positions held, years, and briefly explain each responsibility.

Technical Accomplishments: "Technical Publications", such as books, papers, reports, and standards, are to be listed in chronological order giving author's names, title,

book, journal, or proceedings. "Patents", should be listed by date, number, title, and country of origin. Documentation authentication for "Development of Products or processes", may be listed for items not covered by patents. "Technical Presentations", such as keynote addresses or courses developed by the candidate, should also be listed.

Significant Contributions: Describe the candidate's outstanding contributions in terms of specific items. Provide a short paragraph for each one including a general description of the item, the degree of originality and creativity, and importance of the work to the electrical contact field, and the time period over which the contribution was made. Also, state examples of practices which were developed or modified through contributions by the candidate.

Forward Nominations To: IEEE Holm Award Committee, c/o IEEE Holm Conference Planner, 445 Hoes Lane, Piscataway, NJ 08854 USA

2024 Nominations Deadline: 1 February 2024

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Morton Antler Lecture

The Morton Antler Lecture is an annual technical presentation given at the IEEE Holm Conference on a topic of special interest to the electrical contact community. The lecture series was established in honor of Dr. Morton Antler, a longtime member of the Holm Steering Committee and participant in the Holm Conference. Dr. Antler was a distinguished scientist and lecturer in the fields of electrical contacts, tribology, corrosion, and electrodeposition.

Liquid Metal Interconnects

Pooya Tadayon

Intel Fellow and Director of Assembly & Test Pathfinding
Technology Development Group
Intel Corp.



Abstract: Demand for higher compute density along with an increase in memory and IO bandwidth is a key driver behind the exponential growth in package complexity, size, and pin count. Today's server devices have pin counts up to 7.5K and require >600 pounds of force to maintain electrical connectivity. Pin counts are expected to double to ~15K pins by 2030, with the loading forces exceeding 1000 pounds and keep-out zones doubling in area due to higher load requirements. To connect these packages to the external world, industry uses ball grid array (BGA) or land grid array (LGA) solutions, both of which have significant shortcomings.

Large form factor BGA solutions suffer from high yield losses at surface mount, and the inability to do "late attach" has tax and inventory management implications. LGA solutions offer late attach but come with an electrical performance penalty and a complex loading mechanism that drives up the cost while inhibiting densification due to mechanical keep-out zones.

A novel liquid metal interconnect (LMI) is proposed that offers electrical performance of BGA and the flexibility of socketable LGA, with >10X reduction in loading force which results in a simpler retention mechanism that has reduced keep-out zones and lower cost. There are many challenges, however, to enabling a production worthy LMI that can be made available to the market. New materials, manufacturing processes, characterization techniques, and ecosystem enabling are needed to deliver a solution that meets cost, quality, and reliability requirements. In this talk, some of these challenges and the opportunities for innovation to tackle these challenges will be discussed.

Technical Program

MONDAY, 9 OCTOBER 2023

8:00AM – 8:10AM

INTRODUCTION AND OPENING REMARKS

GEORGE FLOWERS, 2023 IEEE Holm Conference Chair

8:10AM – 9:50AM

YOUNG INVESTIGATOR SESSION

CHAIR: DEEPAK PATIL

CO-CHAIR: DIEGO GONZALEZ

- 1.1 **Polymers in industrial LVDC power systems - aging and polymer-metal interaction effects**
*Marcel Mainka, Thomas Wielsch
Weidmüller Group*
- 1.2 **New Algorithm to Detect and Quantify Resistance Degradation in the Power Delivery System for Electric Machines**
*Ashish Verma, David M. Williams, Julie Kleinau, Drew Gremain
Nexteer Automotive*
- 1.3 **Arc Duration Measurement of Vacuum Interrupter Based on Multi-sensor Fusion**
*Ning Guo, Kevin Whitmore, Samuel Neall, Roderick Gray, Morris Cohen, Raheem Beyah, Lukas Graber
Georgia Institute of Technology*
- 1.4 **Simulation of Rough Electrodes Coupled with Structural Dynamics**
*Benjamin T. Dankesreiter, Chang Dong Yeo
Texas Tech University*
- 1.5 **Investigation on the recovery behavior of the mechanical switching path of DC hybrid circuit breakers**
*Patrick Vieth, Dirk Boesche, Frederik Anspach, Michael Kurrat
elenia Institute for High Voltage Technology and Power Systems*

9:50AM – 10:05 AM BREAK

10:05AM – 11:05AM

HOLM AWARD

CHAIR: JERRY WITTER

0.1 Technology Innovation and Evolution in Circuit Protection

*Xin Zhou
Eaton*

11:05AM – 11:20AM BREAK

11:20AM – 12:20AM

MODELING

CHAIR: GEORGE FLOWERS

CO-CHAIR: ROBERT JACKSON

2.1 Simulation of dynamic behavior and contact bounce of AC contactor

*Gang Wang¹, Renjie Yu¹, Xingwen Li¹, Hua Chen²
¹Xi'an Jiaotong University, ²Siemens Electrical Apparatus Ltd., Suzhou*

2.2 Simulation-Assisted Reliability Study for Fuses Subjected to Thermal-Mechanical Stresses

*Ying Sun, Irma Santos, Todd Dietsch
Littelfuse*

2.3 The cylindrical model of the of heat and mass transfer in electrical contacts during short arc

*S.N. Kharin
Institute of Mathematics and Mathematical Modeling, Almaty, Kazakhstan*

12:20PM – 1:40PM LUNCH (ON YOUR OWN)

YOUNG INVESTIGATOR POSTER SESSION

(CLOSED TO JUDGES ONLY)

1:40PM – 2:40PM

SURFACE EROSION AND WEAR

CHAIR: ROBERT JACKSON

CO-CHAIR: TIMO MÜTZEL

3.1 Behavior of Electrical Contact Elements for High Current Applications during relative axial Motion

*Felix Bölter, Toni Israel, Tom Kufner
Stäubli Electrical Connectors AG*

3.2 The surface characterisation of arc erosion on a structured surface designed to reduce contact bounce

*J.W. McBride¹, K.J Cross², T.G Bull²
¹University of Southampton, UK, ²TaiCaan Technologies Ltd*

3.3 Effects of Brush Spring Force on Brush Wear and Arc Behaviors of Small DC Motor

*Koichiro Sawa¹, Takahiro Ueno¹, Keisaku Nakano², Kazuo Toya²
¹Nippon Institute of Technology, ²Panasonic Industry Co., Ltd.*

2:40PM – 2:55PM BREAK

2:55PM – 3:55PM

FRETTING AND LUBRICATION

CHAIR: SOPHIE NOEL

CO-CHAIR: DAVID WILLIAMS

4.1 Influence of Hardness and Fatigue on the Lifetime of a Modified Silver Coating in Fretting Wear and Corrosion Tests

Roman Probst, Jian Song

Precision Engineering Laboratory; Ostwestfalen-Lippe University of Applied Sciences and Arts

4.2 Electrified Mechanical Contact Arcing Surface Damage and Reduction by Silver Nanoparticle Enhanced Greases

Samuel Bond¹, Robert L. Jackson², German Mills¹

¹Department of Chemistry and Biochemistry, Auburn

²Department of Mechanical Engineering, Auburn

4.3 Effect of Vibration-induced Degradation in High-Speed Backplane Connectors on Digital Signal Transmission

Chaoyi Wang, Jinchun Gao, Kaixuan Song

Beijing Key Laboratory of Work Safety Intelligent

Monitoring Beijing University of Posts and

Telecommunications

4:10PM – 5:10PM

CONTACTOR AND SWITCH DESIGN

CHAIR: XIN ZHOU

CO-CHAIR: ROBERT JACKSON

5.1 A Parameter Design Method for Pick-up Voltage of Busbar-Mounted Electromagnetic Contactor Based on Monte Carlo Sampling

Ding Ding¹, Guofu Zhai¹, Chenglong Zhou², Xu Tan², Libing Shi², Jaixin You¹

¹Harbin Institute of Technology, ²Shaanxi Qunli Electrician Co.,Ltd

5.2 Novel metal contact material for low voltage circuit breakers application

R. Hernandez-Maya, Alejandro Reyes Velazquez

Siemens - R&D Department

5.3 Measurement of electromagnetic attraction force for 3-phase AC contactors

Zhihao Gu¹, Chao Zhang^{1,2}, Wanbin Ren¹

¹Harbin Institute of Technology, School of Electrical Engineering and Automation

²Harbin Institute of Technology, School of Instrumentation Science and Engineering

6:00PM CONFERENCE BANQUET – WEST EVENT BAND

8:00AM – 9:00AM

MATERIALS

CHAIR: JOHN MCBRIDE

CO-CHAIR: DEEPAK PATIL

6.1 The Effects Plated Layers Have on Single Spot Contact Resistance

Robert D. Malucci

RD Malucci Consulting

6.2 On the production and tribo-electrical characterization of carbon nanotube-reinforced copper and silver metal matrix composites

Bruno Alderete, Sebastian Suarez, Frank Mücklich

Saarland University

6.3 From the Bronze Age to the Iron Age - Is the substitution of copper in electrical connectivity imaginable?

Meike Zilm, Marcel Mainka, Viktoria Finkensiep,

Thomas Wielsch

Weidmüller Group

9:00AM – 9:15AM BREAK

9:15AM – 10:15AM

MORTON ANTLER LECTURE

CHAIR: GERALD WITTER

10:15AM – 10:30AM BREAK

10:30AM – 11:50AM

ARC BEHAVIOR

CHAIR: XIN ZHOU

CO-CHAIR: DIEGO GONZALEZ

7.1 Observation of break arc movements of AgSnO₂ contacts under external magnetic field in light-level inductive DC load conditions

Makoto Hasegawa, Shota Kosugi

Chitose Institute of Science & Technology

7.2 Optimized design for thermoplastic side walls for arc chambers used in circuit breakers applications

Sandra Clavijo-Chaparro, Francisco Franco-Caballero,

Marcela Patlan-Rodriguez, R. Hernandez-Maya

Siemens – R&D Department

7.3 Novel design for arc chamber applied to Molded Case Circuit Breakers

R. Hernandez-Maya, Pedro Alvarez Vazquez, Ismael

Francisco Morales, Marcela Patlan-Rodriguez, Carlos

Espinosa-Perez

Siemens – R&D Department

7.4 Research on Extracting Potential DC Arc Fault Features Based on Data Mining Methods

*Hancong Wu¹, Shiwei Ge², Yingqing Zhou¹, Yu Meng¹,
Xingwen Li¹, Silei Chen³, Xiaoshuai Wang³*

¹State Key Laboratory of Electrical Insulation and Power Equipment; Xi'an Jiaotong University

12:00 Noon – 1:30PM AWARDS LUNCHEON

1:30PM – 2:50PM

ARC FAULT DETECTION

CHAIR: DIEGO GONZALEZ

CO-CHAIR: GUANG YANG

8.1 The Correlation Analysis of Photovoltaic Arc Fault Physical and Feature Parameters Based on the Mutual Information Entropy Method

Silei Chen¹, Yusen Zhang¹, Shiwei Ge², Yu Meng³, Qi Yang³

¹Xi'an University of Technology, ²Zhejiang Tengen Electric Co. Ltd., ³Xi'an Jiaotong University

8.2 Research on the Optimization Scheme of Arc Fault Detection Hardware Parameters Based on Bayesian Optimization

Qi Yang¹, Jing Wang², Yuming Zhao², Yu Meng¹, Xingwen Li¹

¹State Key Laboratory of Electrical Insulation and Power Equipment Xi'an Jiaotong University, ²Shenzhen Power Supply

8.3 Study of the Detection Method of Series AC Arc Faults Based on High-frequency Zero-sequence Current Coupling Signal

Zhipeng He, Yezhen Zhang, Weilin Li, Hu Zhao, Bingqiang Li

School of Automation Northwestern Polytechnical University Xi'an, P.R. China

8.4 Impact of the Sampling Frequency on the Detection of Series DC Arc Faults in an Aeronautical Environment Using Machine-learning Techniques

Raul Carreira Rufato¹, Thierry Ditchi², Cathy Rond³, Cyril Van de Steen³, Thierry Lebey³, and Yacine Oussar²

¹Safran Tech & LPEM, Safran Group & ESPCI Paris - PSL, CNRS, Sorbonne Université. Institute of Technology, ²LPEM, ESPCI Paris - PSL, CNRS, Sorbonne Université, ³Safran Tech - Safran Group

2:50PM – 3:05PM BREAK

3:05PM – 4:25PM

RELIABILITY

CHAIR: DAVID WILLIAMS

CO-CHAIR: ROBERT JACKSON

9.1 Advances in Evaluation of State of Health of Electrical Connectors

*Jian Song, Abhay Shukla, Roman Probst
Ostwestfalen-Lippe University of Applied Sciences and Arts*

9.2 Application of Parameter Evaluation and PSO-BP Neural Network for Relay Contact Life Prediction

*Zhaobin Wang, Jimiao Zhu, Jiuxin Li, Shaofei Li, Wenhang Zhang, Chuyang Han
College of Automation Jiangsu University of Science and Technology*

9.3 Investigation of the degradation process and failure mechanisms of AC contactor in the electrical endurance experiment

*Yubin He, Zhihao Gu, Chao Zhang, Wanbin Ren
School of Electrical Engineering and Automation, Harbin Institute of Technology*

9.4 Pb-free solder contact reliability at extreme condition and in phase transition

*Zimmer M. Gavin, Zou Yu, Szklenar M. Flora, Khan M. Ashraf
ECE Department – Saginaw Valley State University*

4:30M – 5:30PM TC1 MEETING

CHAIR: GERALD WITTER

8:00AM – 9:00AM

CONNECTORS AND SYSTEM PERFORMANCE

CHAIR: Z.K. CHEN

CO-CHAIR: XIN ZHOU

10.1 Heat Dissipation of Electrical Connections with Horizontal Insulated Cable

James Ferree

SI EP NA R&D EL MECH, Siemens Industry Inc

10.2 The Impact of Electrical Contact Degradation of Conductive Foam on Near-field Radiation

Ziren Wang¹, Shaogeng An¹, Jiawei Zang¹, Qiuyan Jin², Zekun Wang³, Rui Ji¹

¹China Telecommunication Technology Labs - China Academy of Information and Communications

Technology, ²School of Information Science and

Technology Southwest - Jiaotong University, ³School of Mechatronic Engineering and Automation - Shanghai University

10.3 System level and multiphysics approaches to simulate low voltage circuit breaker interruption

Pierantonio Arrighetti¹, Pierre Corfdir², Teodora Ilic³

¹ABB S.p.A., ²ABB Switzerland Ltd, ³Hitachi Energy Switzerland Ag

9:00AM – 9:15AM BREAK

9:15AM – 10:35AM

DC SWITCHING

CHAIR: GUANG YANG

CO-CHAIR: Z. K. CHEN

11.1 Characterization of arc plasma during hybrid-switching using a DC-Hybrid model switch

Diego Gonzalez¹, Ralf Methling¹, Sergey Gortschakow¹, Hendrik Koepf², Peter Steegmueller², Stefan Holbe²

¹Leibniz Institute for Plasma Science and Technology (INP), ²E-T-A Elektrotechnische Apparate GmbH

11.2 Response and Control of Individual Stacks of a Multi-Stack Piezoelectric Actuator for DC Fast Disconnect Switches

Amrita Ghosh, Zhiyang Jin, Kevin Whitmore, Maryam Tousi, Lukas Graber

School of Electrical and Computer Engineering - Georgia Institute of Technology

11.3 Establishment and Application of Rebound Dynamics Model for High-Voltage DC Contactor

Yu Wang, Huimin Liang, Zitong Wei, Xue Zhou
Harbin Institute of Technology

11.4 Analysis of LVDC Microgrid Protection Requirements and Application of Hybrid Circuit Breaker

Caizhi Gao¹, Zhaozi Zhang¹, Jianing Xu¹, Tianyu Gao², Silei Chen³, Xingwen Li¹

¹State Key Laboratory of Electrical Insulation and Power Equipment, ²China Electric Power Research Institute, ³School of Electrical Engineering Xi'an University

10:35AM –10:50AM BREAK

10:50AM – 12:10PM

SLIDING, FRETTING, AND LUBRICATION

CHAIR: JIAN SONG

CO-CHAIR: GEORGE FLOWERS

12.1 Investigation on Melt Erosion Phenomenon of Heavy-Duty Connectors under Fretting Conditions

Yuan Meng¹, He Fang², Chao Zhang^{1,3}, Yubin He¹, Wanbin Ren¹

¹School of Electrical Engineering and Automation, Harbin Institute of Technology, ²Harbin Aviation Ammunition Institute, China North Industries Group Co. Ltd, ³School of Instrumentation Science and Engineering, Harbin Institute of Technology

12.2 Electrical and tribological behaviour of gold/gold sliding contacts of the wire/ring type for slip-ring applications

Corentin Ferreira^{1,2}, Aurore Brézard-Oudot¹, Manon Isard², Sophie Noël¹, Frédéric Houzé¹; Philippe Testé¹

¹Université Paris-Saclay, CentraleSupélec, CNRS, Laboratoire de Génie Électrique et Électronique de Paris, Sorbonne Université, CNRS, Laboratoire de Génie Électrique et Électronique de Paris

² Everaxis Aerospace & Defence

12.3 New developments in PFPE lubrication: application to tinned electrical contacts

Sophie Noël¹, Aurore Brézard-Oudot¹, Thierry Leblanc¹, Christine Hamon², Andrea Lotierzo², Annelise Murillo², Gaetano Calvaruso²

¹ Université Paris-Saclay, CentraleSupélec, CNRS, Laboratoire de Génie Électrique et Électronique de Paris, Sorbonne Université, CNRS, Laboratoire de Génie Électrique et Électronique de Paris ²Solvay Materials, Viale Lombardia

12.4 Mechanical Sn plating applied to rotary electrical joints

Francisco Franco-Caballero, Carlos A. Espinosa-Perez, Osvaldo Sotelo-Quijano, Ismael F. Morales-Treviño, R. Hernandez-Maya

Siemens – R&D Department

12:10PM

CLOSING REMARKS

GEORGE FLOWERS, 2023 HOLM CONFERENCE CHAIR

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