

## **2011 Operating Committee**

Thomas J. Schoepf, Chair  
Brett Rickett, Vice Chair  
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Gerald Witter, TC1 Chair  
Robert Malucci, TC1 Vice Chair  
Chi Leung, Publicity Chair  
Paul Slade, Course Instructor/International Rep.

## **2011 Awards Committee**

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John McBride  
John Shea

## **2011 Prize Paper Award Committee**

Guenther Horn, Chair  
Marjorie Myers  
Ed Smith III

## **2011 - 2012 Associate Editors - CPMT**

John McBride  
Thomas J. Schoepf  
Milenko Braunovic

## **International Advisory Committee and IC Director**

Paul Slade

## **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 2011 IEEE Holm Conference will include excellent papers authored by outstanding technical people in this field. The international contributors come from Austria, Canada, China, France, Germany, Japan, Spain, Switzerland, Taiwan, United Kingdom and the USA. 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 and scientist.

Additionally, the 2011 IEEE Holm Conference will make it possible for any attendee to discuss personally, with any author, either additional details concerning the work presented by the author at the conference or any subject related to the author's field of expertise.

## **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 REGISTRATON

	Prior To 11 August	After 11 August
<b>Conference only</b>		
IEEE Member	\$675	\$750
Non-Member	\$750	\$825
Student/Life Member	\$300	\$350

## CONFERENCE REGISTRATION HOURS

Sunday, 11 September	4:00PM – 6:00PM
Monday, 12 September	7:00AM – 5:00PM
Tuesday, 13 September	8:00AM – 5:00PM
Wednesday, 14 September	8:00AM – 2:00PM

### Registration can be completed online:

<http://www.cvent.com/events/2011-ieee-holm-conference/event-summary-114c9cc00d2e4ae9bffb94a0af4b5724.aspx>

Registration payments: Checks are to be made out to the IEEE HOLM in US\$. Visa, MasterCard, Discover, and American Express. Please mail your payment along with the enclosed registration form to:

**IEEE Holm Conference**  
IEEE Meeting & Conference Management  
445 Hoes Lane  
Piscataway, NJ 08854  
Fax: +1 732 465 6447

For additional information please contact  
Holm Registrar, at:

Directo Phone: +1 732 465 6620  
Fax: +1 732 465 6447  
US and Canada: +1 800 810 4333  
Elsewhere: +1 732 465 7810  
Email: [holm11reg@ieee.org](mailto:holm11reg@ieee.org)

## WELCOME RECEPTION

All conference attendees are invited to register early and attend our welcome reception on Sunday, 11 September from 4:00PM – 6:00PM at the Crowne Plaza Northstar hotel.

## Hotel Accommodations

### **57th IEEE Holm Conference on Electrical Contacts:**

The 2011 conference meets in Minneapolis, Minnesota at the Crowne Plaza NorthStar, where meeting facilities are well suited to the conference sessions and other activities. The hotel is offering special rates of US\$129 single/double occupancy to conference attendees. Rates are subject to 13.4% tax. To make a reservation please call the Crowne Plaza NorthStar hotel at +1 800 2 CROWNE and reference group code "2011 HOLM Conference" in order to receive the group rate. The rate is valid until 17 August 2011 at 5:00PM CST. Reservations received after this date are subject to space and availability.

Check in time: 3:00PM

Check out time: 12:00PM

Crowne Plaza NorthStar  
618 2nd Avenue South  
Minneapolis, MN 55402  
+1 612.338.2288

## Transportation From Airports

### **Taxis and Buses:**

Please refer to <http://www.mspairport.com/GroundTransportation.aspx> for additional information regarding the airport and local transportation. The Crowne Plaza Northstar hotel is a 20 minute trip and taxis are available at the airport and should cost approximately US\$35 each way, depending on time of day and traffic.

### **Driving:**

If you are arriving by your own transportation, parking fees at the Crowne Plaza NorthStar are as follows:

Daily Self Parking: US\$20/day on weekdays

Daily Self Parking: US\$11/day on weekends

Weekend rates begin on Friday at 2:30 pm

For specific driving directions from the Minneapolis-St. Charles International Airport (MSP), consult Map Quest at [www.mapquest.com](http://www.mapquest.com) or call the hotel directly at +1 612.338.2288.

## Social Event

### Conference Banquet

**Seven Restaurant**  
**Monday, 12 September 2011**  
**7:00PM**



From the award winning producer of ultimate fine dining and entertainment, David Koch, comes a new concept that brings the glamour and hospitality of the past to Hennepin Avenue.

The curtain now rises on Koch's latest production. Located next to Pantages Theatre, this dramatic, three-level destination will light up the corner of 7th and Hennepin with two very distinct dining and entertainment experiences. Every level is meticulously designed to provide areas perfect for larger social events or for a more intimate rendezvous.

Each conference attendee will receive a ticket to attend the social event at the Seven Restaurant. Additional tickets may be purchased for the rate of US\$80.

# 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 the 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 institute. “Society Membership”, list various professional society affiliations. Under society activities list officers 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 “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 to 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 cases of examples of practices which were developed or modified through contributions of the candidate.

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

**2012 Nominations Deadline:** 15 December 2011

**THE 57TH IEEE HOLM CONFERENCE  
ON ELECTRICAL CONTACTS (2011)**

The 58th IEEE Holm Conference on Electrical Contacts will be held 23-26 September 2012 in Portland, OR, USA.

Prospective authors should submit a brief abstract (200 words maximum) online before 20 January 2012. Authors will be notified concerning acceptance of abstracts on 26 February 2012. Please include complete contact information for all correspondence to be sent.

**Abstracts are to be submitted through the  
IEEE Conference eXpress website:  
<http://www.ieee.org/conferencepublishing>  
Enter conference ID – holm12  
(please use lower case)**

**Important Dates**

20 January 2012	Abstract Deadline
26 February 2012	Notification of Acceptance
3 May 2012	Completed Paper Deadline
23 September 2012	Conference Begins

**Correspondence Address**

IEEE Meeting & Conference Management  
IEEE Holm Conference (2012)  
445 Hoes Lane  
Piscataway, NJ 08854  
US and Canada: +1 800 810 4333  
Elsewhere: +1 732 465 7810  
Fax: +1 732 465 6447  
Email: [d.zeigler@ieee.org](mailto:d.zeigler@ieee.org)

**Holm Website:**

[www.ewh.ieee.org/soc/cpmt/tc1/](http://www.ewh.ieee.org/soc/cpmt/tc1/)

## Morton Antler Lecture

The Morton Antler Lecture is an annual lecture given at the IEEE Holm Conference on a topic of special interest to the electrical contact community. This lecture series was established in honor of Dr. Morton Antler, a long time 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.

### **“Modern Design of Experiments (DOE) After 75 Years of Advancements in Multifactor Test Methods”**

**Mark Anderson**

Principal and General Manager  
Stat-Ease, Inc.

Minneapolis, MA 55413-2726



Mark is a principal and general manager of Stat-Ease a DOE software company in Minneapolis. Prior to joining the firm, he spearheaded an award-winning quality improvement program for an international manufacturing firm, that generated millions of dollars of savings. Mark is the co-author of two books in the DOE field, “DOE Simplified: Practical Tools for Effective Experimentation” and “RSM Simplified: Optimizing Processes Using Surface

Methods for Design of Experiments”. He has also published numerous articles on design of experiments. He is a guest lecturer at the University of Minnesota Chemical Engineering and Material Science Departments and also at the Ohio State University Fisher College of Business. He holds a BS degree in Chemical Engineering from University of Minnesota and an MBA, from University of Minnesota. He is also both a professional engineer, (PE), and a certified quality engineer, (CQE).

**Supporters of  
The 57th IEEE Holm  
Conference on  
Electrical Contacts**

**Platinum Level**

CHECON Corporation

**Gold Level**

Burn-in & Test Socket Workshop (BiTS)

Chugai USA, LLC

Heraeus Materials Technology, W.C. Heraeus GmbH

Engineered Materials Division

TE Connectivity

**Silver Level**

DODUCO GmbH

Eaton Corporation

Metalor

Naeco, LLC

Umicore Technical Materials NA Inc.

**Bronze Level**

Branin, a division of Precision Engineered Products

Deringer Ney, Inc.

Molex, Inc.

Rockwell Automation

# Technical Program

**MONDAY, 12 SEPTEMBER 2011**

**8:00AM**

## **INTRODUCTION AND OPENING REMARKS**

Thomas J. Schoepf, 2011 IEEE Holm Conference Chair

**8:10AM – 9:10AM**

## **ARC INTERRUPTION I**

**CHAIR: P. SLADE**

**CO-CHAIR: G. HORN**

### **1.1 Low-voltage arc simulation with out-gassing polymers**

Christian Rümpler, Fraunhofer Institute SCAI, Germany; Hartwig Stammberger, Eaton Industries GmbH, Germany; and Albert Zacharias, Eaton Industries GmbH, Germany

### **1.2 Experimental investigation of the interaction of interrupting arcs and gassing polymer walls**

Diego Gonzalez, Technische Universitaet Ilmenau, Germany; Heinz Pursch, Eaton Industries GmbH, Germany; and Frank Berger, Technische Universitaet Ilmenau, Germany

### **1.3 Influence of Voltage and Current on Arc Duration and Energy of DC Electromagnetic Contactor**

Kiyoshi Yoshida, Nippon Institute of Technology, Japan; Koichiro Sawa, Nippon Institute of Technology, Japan; Kenji Suzuki, Fuji Electric FA Components & Systems Co., Ltd., Japan; Masaaki Watanabe, Fuji Electric FA Components & Systems Co., Ltd., Japan; and Hideki Daijima, Fuji Electric FA Components & Systems Co., Ltd., Japan

**9:30AM – 9:50AM**

**BREAK**

**9:50AM – 10:50AM**

## **YOUNG INVESTIGATOR AWARD**

**CHAIR: E. SMITH**

**CO-CHAIR: R. MARTENS**

**SHORT INTRODUCTION BY PAUL SLADE**

### **2.1 A Preliminary Investigation of Graphite, Graphene and Carbon Nanotubes (CNT's) As Solid State Lubricants**

Andrew Loyd, TE Connectivity, United States; Jessica Hemond, TE Connectivity, United States; and Rod Martens, TE Connectivity, United States

- 2.2 Contact Resistance with Dissimilar Materials: Bulk Contacts and Thin Film Contacts**  
Peng Zhang, University of Michigan - Ann Arbor, United States; Y. Y. Lau, University of Michigan - Ann Arbor, United States; W. Tang, Air Force Research Laboratory, United States; M. R. Gomez, Sandia National Laboratories, United States; D. M. French, Air Force Research Laboratory, United States; J. C. Zier, Naval Research Laboratory, United States; and R. M. Gilgenbach, University of Michigan - Ann Arbor, United States
- 2.3 Arc Fault Model of Conductance. Application to the UL1699 Tests Modeling**  
Jonathan ANDREA, esterline, France; patrick schweitzer, lien, France; and JM Martel, SIEMENS, Germany
- 2.4 High current arc erosion on copper electrodes in air**  
Thomas Øyvang, Telemark University College, Norway; Elin Fjeld, Telemark University College, Norway; Wilhelm Rondeel, Telemark University College, Norway; and Svein Thore Hagen, Telemark University College, Norway
- 2.5 Whisker Growth Under Controlled Humidity Exposure**  
Erika Crandall, Auburn University, United States; George Flowers, Auburn University, United States; Pradeep Lall, Auburn University, United States; and Michael Bozack, Auburn University, United States

**11:30AM – 12:30PM**  
**LUNCH ON OWN**

**1:00PM – 2:00PM**  
**FUNDAMENTALS**  
**CHAIR: R. TIMSIT**  
**CO-CHAIR: Z.K. CHEN**

- 3.1 The Effects of Current Density Variations in Power Contact Interfaces**  
Robert Malucci, RD Malucci Consulting, United States

- 3.2 Direct Observation of Current Density Distribution in Contact Area by Using Light Emission Diode Wafer**  
Shigeru Sawada, Mie Univ., Japan; Shigeki Tsukiji, Mie Univ., Japan; Terutaka Tamai, AutoNetworks Technologies, Ltd., Japan; Yasuhiro Hattori, AutoNetworks Technologies, Ltd., Japan; and kazuo Iida, Mie Univ., Japan
- 3.3 Effect of Contact Parameters on Current Density Distribution in a Contact Interface**  
Marjorie Myers, TE Connectivity, United States; Michael Leidner, TE Connectivity, Germany; and Helge Schmidt, TE Connectivity, Germany

**2:00PM – 2:20PM**

**BREAK**

**2:20PM – 3:20PM**

**FRETTING**

**CHAIR: B. MALUCCI**

**CO-CHAIR: B. RICKETT**

- 4.1 Fretting behavior of nickel coatings for electrical contact applications**  
Sophie Noël, Supelec, France; David Alamarguy, Supelec, France; Sandra Correia, Supelec, France; and Pierre Laurat, Legrand, France
- 4.2 Research on fretting resistance and fretting wear property of Ni-Au contact pair**  
Xue-Yan Lin, Research Lab of Electrical Contacts, BUPT, China; Liang-Jun Xu, Research Lab of Electrical Contacts, BUPT, China; Yan-Chao Shao, Research Lab of Electrical Contacts, BUPT, China; and Guo-Ping Luo, Nokia Cooperation, Finland
- 4.3 Measurement of Contact Resistance Distribution in Fretting Corrosion Track for the Tin Plated Contacts**  
Soushi Masui, Mie Univ., Japan; Shigeru Sawada, Mie Univ., Japan; Terutaka Tamai, AutoNetworks Technologies, Ltd., Japan; Yasuhiro Hattori, AutoNetworks

**3:20PM – 3:40PM**

**BREAK**

**3:40PM– 5:00PM**

**RELAYS / ARCING**

**CHAIR: C. LEUNG**

**CO-CHAIR: D. MOORE**

**5.1 Contact resistance characteristics of relays operated in silicone-vapor-containing and non-silicone atmospheres with different electrical load conditions**

Makoto Hasegawa, Chitose Institute of ScienceTechnology, Japan;Nanae Kobayashi, Chitose Institute of ScienceTechnology, Japan; and Yoshiyuki Kohno, Kaneka Corporation, Japan

**5.2 Evaluation of contact surface damages with an optical cross-section method**

Makoto Hasegawa, Chitose Institute of ScienceTechnology, Japan; and Keisuke Takahashi, Chitose Institute of Science and Technology, Japan

**5.3 The Effect of mechanical parameters of switch-type contact on relay operation characteristics**

Wanbin Ren, Harbin Inst. of Tech., China;Songjun Ma, Harbin Inst. of Tech., China;Guofu Zhai, Harbin Inst. of Tech., China; and Huadong Xu, Beijing GO-WELL

**5.4 Development of Contact Material Solutions for Low-Voltage Circuit Breaker Applications (2)**

Timo Mützel, Umicore AG & Co. KG, Germany; and Ralf Niederreuther, Umicore AG & Co. KG, Germany

**5.5 Transient Phenomena from Melting to Electric Discharge during Making and Breaking Operations of Electric Contacts**

Noboru Wakatsuki, Ishinomaki Senshu Univ., Japan;Takayuki Kudou, Ishinomaki Senshu Univ., Japan; and Nobuo Takatsu, Ishinomaki Senshu Univ., Japan

**7:00PM**

**SOCIAL – SEVEN RESTAURANT**

## **TUESDAY, 13 SEPTEMBER 2011**

**8:00AM – 9:20AM**

### **ARC FAULT / ELECTRICAL SAFETY**

**CHAIR: T. SCHOEPF**

**CO-CHAIR: H. CZAJKOWSKI**

- 6.1 RF Current Produced from Electrical Arcing**  
John Shea, Eaton Corporation, United States; and  
Jason Carrodus, Eaton Corporation, United States
- 6.2 Method to Design Arc Fault Detection Algorithm  
using FPGA**  
Michaël Rabla, Université Henri Poincaré, France;  
and Patrick Schweitzer, Université Henri Poincaré,  
France
- 6.3 Influence of Capacitive and Inductive Loads on  
the Detectability of Arc Faults**  
Peter Müller, University of Stuttgart, Germany; Stefan  
Tenbohlen, University of Stuttgart,  
Germany; Reinhard Maier, Siemens AG, Germany;  
and Michael Anheuser, Siemens AG, Germany
- 6.4 Characteristics of Overheated Electrical Joints  
due to Loose Connection**  
Xin Zhou, Eaton Corporation, United States; and  
Thomas Schoepf, Eaton Corporation, United States

**9:20AM – 9:40AM**

**BREAK**

**9:40AM – 10:40AM**

### **MORT ANTLER LECTURE**

#### **MODERN DESIGN OF EXPERIMENTS (DOE)**

#### **AFTER 75 YEARS OF ADVANCEMENTS IN**

#### **MULTIFACTOR TEST METHODS**

**Mark Anderson, Principal and General Manager,  
Stat-Ease Inc.**

**10:40AM – 11:00PM**

**BREAK**

**11:00AM – 12:20PM**

**MODELLING**

**CHAIR: X. ZHOU**

**CO-CHAIR: R. JACKSON**

- 7.1 Numerical study of asperity distribution in an electrical contact**  
Per Lindholm, ABB Corporate Research, Sweden
- 7.2 Computational Modeling and Analysis of a Contact Pair for the Prediction of Fretting Dependent Electrical Contact Resistance**  
Keiji Mashimo, Furukawa Electric co., Ltd., Japan;  
and Yasuyuki Ishimaru, FITEC Corp., Japan
- 7.3 A Discrete analysis of gold surface asperities deformation under spherical nano-indentation towards electrical contact resistance calculation**  
Brice Arrazat, Centre Microélectronique de Provence - Georges Charpak, Ecole Nationale Supérieure des Mines de Sain, France; Pierre-Yves Duvivier, CEA, Leti, Minatec, Grenoble, France, France; Vincent Mandrillon, CEA, Leti, Minatec, Grenoble, France, France; and Karim Inal, Centre Microélectronique de Provence - Georges Charpak, Ecole Nationale Supérieure des Mines de Sain, France
- 7.4 The Effect of Coil on Combined Three-Subsection Permanent Magnet in Close Magnetic Circuit Model**  
You Jiabin, Harbin Institute of Technology, China;  
Liang Huimin, Harbin Institute of Technology, China;  
Ye Xuerong, Harbin Institute of Technology, China;  
and Zhai Guofu, Harbin Institute of Technology, China

**12:20PM – 1:40PM**

**AWARDS LUNCHEON**

**1:40PM – 2:40PM**

**MEMS/MICRO-CONTACT**

**CHAIR: K. SAWA**

**CO-CHAIR: R. COUTU**

**8.1 Gold Coated Carbon-Nanotube Surfaces as Low Force Electrical Contacts for MEMS devices: Part II, Fine Transfer Mechanisms**

John McBride, University of Southampton, United Kingdom; Mark Spearing, University of Southampton, United Kingdom; Liudi Jiang, University of Southampton, United Kingdom; and Chamaporn Chianrabutra, University of Southampton, United Kingdom

**8.2 A Nano-scale Investigation of Material Transfer Phenomena at Make in a MEMS switch**

Christophe Poulain, CEA-LETI, France; Alexis Peschot, CEA-LETI, France; Maxime Vincent, University of California, Berkeley, United States; and Nelly Bonifaci

**8.3 Compliant Carbon Nanotube-Metal Contact Structures**

Onnik Yaglioglu, Massachusetts Institute of Technology, United States; Rod Martens, Massachusetts Institute of Technology, United States; Anyuan Cao, Peking University, China; and A. H. Slocum, Massachusetts Institute of Technology, United States

**2:40PM – 3:00PM**

**BREAK**

**3:00PM – 4:00PM**

**CONNECTOR DEGRADATION I**

**CHAIR: J. McBRIDE**

**CO-CHAIR: M. MYERS**

**9.1 A Summary Report on the Mechanism of Electric Contact Failure due to Particle Contamination**

Ji Gao Zhang, Emeritus Professor, China

## **9.2 Correlation of Intrinsic Thin Film Stress Evolution and IMC Growth with Whisker Growth**

Chad Rodekohl, Presbyterian College, United States; George T. Flowers, Auburn University, United States; Michael J. Bozack, Auburn University, United States; Rob Jackson, Auburn University, United States; Rod Martens, TE Connectivity, United States; Zhijun Zhao, Western Digital, United States; Erika Crandall, Auburn University, United States; Vern Starman, Air Force Institute of Technology, United States; Thomas Bitner, Presbyterian College, United States; and Jacob Street, Presbyterian College, United States

## **9.3 A Study on Mobile Communication Device Structure Design Resisting Dust Particles Ingress**

Na Lu, Beijing University of Posts and Telecommunications, Beijing, China

**4:00PM – 4:20PM**

**BREAK**

**4:20PM – 5:40PM**

## **ARC INTERRUPTION II**

**CHAIR: J. SHEA**

**CO-CHAIR: G. HAUPT**

### **10.1 A Study of arc duration on supple carbon contacts in the automotive field**

Jerome Praquin, Renault, France; Christophe Gautherot, Renault, France; Jean Rivenc, Renault, France; Nouredine Ben Jemaa, University of Rennes, France

### **10.2 Effects of rotational motion of break arcs on arc duration and contact erosion**

Junya Sekikawa, Shizuoka University, Japan; and Takayoshi Kubono, Shizuoka University, Japan

### **10.3 AC Electrical Arcs With Graphite Electrodes**

Erwann Carvou, Universite de Rennes 1, France; Brian Mitchell, Universite de Rennes 1, France; Nouredine Ben Jemaa, Universite de Rennes 1, France; Simon Tian, Schneider Electric, France; and Zakaria Belhaja, Schneider Electric, France

**5:40PM**

**TC1 MEETING**

## WEDNESDAY, 14 SEPTEMBER 2011

8:00AM – 9:20AM

### HIGH POWER SLIDING/CONTACT RESISTANCE

CHAIR: S. COLE

CO-CHAIR: D. GAGNON

- 11.1 Effect of Lubricant on Degradation Process of Au-plated Slip-Ring and Ag-Pd Brush System for Small Electric Power**  
Koichiro Sawa, Nippon Institute of Technology, Japan; Yasunori Suzuki, Nippon Institute of Technology, Japan; Noboru Morita, Nippon Institute of Technology, Japan; Takahiro Ueno, Nippon Institute of Technology, Japan; and Kaoru Endo, Nideco Servo Corporation, Japan
- 11.2 Pantograph Arc's Energy Characters Under Various Load**  
Bo Wang, Southwest Jiaotong University, China; Guangning Wu, Southwest Jiaotong University, China; Lijun Zhou, Southwest Jiaotong University, China
- 11.3 Pantograph Arcing's Impact on Locomotive Equipments**  
Tianzhi Li, Southwest Jiaotong University, China; Guangning Wu, Southwest Jiaotong University, China; Lijun Zhou, Southwest Jiaotong University, China; Guoqiang Gao, Southwest Jiaotong University, China; Wangang Wang, Southwest Jiaotong University, China; Bo Wang, Southwest Jiaotong University, China; Donglai Liu, Southwest Jiaotong University, China; and Dajian Li, Southwest Jiaotong University, China
- 11.4 An Experimental Study to show the behavior of Electrical Contact Resistance and Coefficient of Friction at Low Current Sliding Electrical Interfaces**  
Junya Sekikawa, Shizuoka University, Japan; and Takayoshi Kubono, Shizuoka University, Japan

9:20AM – 9:40AM

**BREAK**

9:40AM – 10:40AM

### SLIDING

CHAIR: BEN JEMAA

CO-CHAIR: G. FLOWERS

- 12.1 There is tin and there is tin – characterisation of tribological and electrical properties of electro-plated tin surfaces**  
Frank Ostendorf, Weidmueller Interface GmbH & Co. KG, Germany; Thomas Wielsch, Weidmueller Interface GmbH & Co. KG, Germany; and Michael Reiniger, Weidmueller Interface GmbH & Co. KG, Germany
- 12.2 Study on Characterization of Electrical Contact Between Pantograph and Catenary**  
Wangang Wang, Southwest Jiaotong University, China; Anping Dong, Southwest Jiaotong University, China; Guangning Wu, Southwest Jiaotong University, China; Guoqiang Gao, Southwest Jiaotong University, China; Lijun Zhou, Southwest Jiaotong University, China; Bo Wang, Southwest Jiaotong University, China; and Yi Cui, Southwest Jiaotong University, China
- 12.3 The Effect of Various Atmospheric Temperature on the Contact Resistance of Sliding Contact on Silver Coating Slip Ring and Silver Graphite Brush**  
Emad Barnawi, Nippon Institute of Technology, Japan; Koichiro Sawa, Nippon Institute of Technology, Japan; Noboru Morita, Nippon Institute of Technology, Japan; and Takahiro Ueno, Nippon Institute of Technology, Japan

**10:40AM – 11:00AM**

**BREAK**

**11:00AM – 12:00PM**

**CONNECTORS/CONTACT RESISTANCE**

**CHAIR: J.G. ZHANG**

**CO-CHAIR: M. MYERS**

- 13.1 Peculiar Phenomenon in Friction Coefficient of Tin Plated Connector Contacts with Application of Lubricant**  
Terutaka Tamai, Elcontech consulting, Ltd., Japan; Shigeru Sawada, Mie University, Japan; and Yasuhiro Hattori, AutoNetworks Technologies, Ltd., Japan
- 13.2 Stress Analysis of Dust Particle on the Electrical Contact Surface**  
Yang Lv, Electric Contact Lab Automation School Beijing University of PostsTelecommunications, China; and Liangjun Xu, Electric Contact Lab Automation School Beijing University of Posts and Telecommunications, China

- 13.3 Stress-Strain Response of Copper-based Spring Materials under Forward and Reverse Deformations and Its Mathematical Description**  
Yasuhiro HATTORI, AutoNetworks Technologies, Ltd., Japan; Kingo FURUKAWA, AutoNetworks Technologies, Ltd., Japan; and Fusahito YOSHIDA, Hiroshima

**12:00PM – 1:00PM**

**LUNCH ON YOUR OWN**

**1:00PM – 2:20PM**

**CONNECTOR DEGRADATION II**

**CHAIR: B. RICKETT**

**Co-CHAIR: R. MARTENS**

- 14.1 Growth of Sn Whiskers Under Net Compressive and Tensile Stress States**  
Erika Crandall, Auburn University, United States; George Flowers, Auburn University, United States; Robert Jackson, Auburn University, United States; Pradeep Lall, Auburn University, United States; and Michael Bozack, Auburn University, United States
- 14.2 Degradation phenomena of electrical contacts using hammering oscillating mechanism and micro-sliding mechanism- Contact resistance and its model**  
Shin-ichi Wada, company, Japan; and Koichiro Sawa, university, Japan
- 14.3 The Influence of the Organic Compounds on the Contaminated Electrical Contacts**  
YILIN ZHOU, Beijing University of PostsTelecommunications, China; YANG LV, Beijing University of PostsTelecommunications, China; and HAO WANG, Beijing University of Posts and Telecommunications, China
- 14.4 Selected aspects of the electrical behavior in sliding electrical contacts**  
Christian Holzapfel, Schleifring und Apparatebau GmbH, Germany

**2:20PM**

**CLOSING REMARKS**

**THOMAS J. SCHOEPF**





# Conference Registration

## 57th IEEE Holm Conference on Electrical Contacts 11 - 14 September 2011

Crowne Plaza Northstar, Minneapolis, MN, USA

First/Given Name

Last/Family/Surname

Organization

Address

City

State

Country

Postal Code

Email

Telephone

Fax

IEEE Member Number

Are you an Author? Yes / No If "yes" please advise paper number: \_\_\_\_\_

**HOLM Conference Registration Includes: Proceedings, Monday Social Function, Wednesday Conference Banquet**

**Intensive Course Registration Includes: Course Notes, Coffee Breaks**

### Circle Registration Fee

<u>CONFERENCE</u>	<u>ON or BEFORE</u> <u>11 Aug 2011</u>	<u>AFTER</u> <u>11 Aug 2011</u>
IEEE Member	\$675	\$750
Non-Member	\$750	\$825
Student/Life Member	\$300	\$350

### ADDITIONAL ITEMS

Conference Banquet:	\$80 x _____ = _____
Extra Copy of Hard Proceedings:	\$80 x _____ = _____
DVD - All Past Proceedings:	\$80 x _____ = _____
Additional Awards Luncheon Ticket:	\$40 x _____ = _____

**TOTAL REMITTANCE (must be in USD)** \$ \_\_\_\_\_

### **METHOD OF PAYMENT**

Check in (USD) made out to IEEE Holm Conference

Credit Card

Please Circle: American Express MasterCard Visa Discover Card

Card # \_\_\_\_\_ Exp. Date \_\_\_\_\_

Name on Card \_\_\_\_\_

Signature \_\_\_\_\_

**CANCELLATION POLICY:** All refund/cancellation requests must be provided in writing and received by 8/11/2011. There will be an administrative fee of \$100 deducted from each refund. Please submit all cancellation/refund requests to holm11reg@ieee.org.

### **Mail/Fax Completed Registration Form & Fees To:**

IEEE Holm Conference

IEEE Meeting & Conference Management

445 Hoes Lane, Piscataway, NJ 08854, USA

Direct Phone: +1 732 465 6620

Fax: +1 732 465 6447

US and Canada: +1 800 810 4333 Outside US: +1 732 465 7810

Email: holm11reg@ieee.org