

IEEE HOLM CONFERENCE
IEEE Meeting & Conference Management
445 Hoes Lane
Piscataway, NJ 08854

FIRST CLASS
U.S. Postage
PAID
IEEE
New Brunswick, NJ
Permit No. 654

VISIT US ON THE WEB AT: www.ewh.ieee.org/soc/cpmt/tc1/

Final Program

58TH IEEE HOLM CONFERENCE ON ELECTRICAL CONTACTS



23 - 26 SEPTEMBER 2012
DOUBLETREE BY HILTON PORTLAND
PORTLAND, OR, USA



Sponsored By:
The Components, Packaging, and
Manufacturing Technology Society of
The Institute of Electrical and
Electronics Engineers, Inc.

2012 HOLM Conference Officers

OPERATING COMMITTEE CHAIR

Thomas J. Schoepf, EATON CORPORATION

VICE OPERATING COMMITTEE CHAIR

Bretton Rickett, MOLEX, INC.

FINANCE CHAIR

Henry Czajkowski, ROCKWELL AUTOMATION

TECHNICAL PROGRAM CHAIR

Rod Martens, TE CONNECTIVITY

TECHNICAL PROGRAM VICE CHAIR

George T. Flowers, AUBURN UNIVERSITY

CPMT TECHNICAL COMMITTEE 1 ELECTRICAL CONTACTS

Gerald Witter, CHUGAI USA, LLC

PUBLICITY CHAIR

Chi Leung, Metalor Technologies

INTENSIVE COURSE DIRECTOR, AND US REPRESENTATIVE FOR THE INTERNATIONAL CONFERENCE

Paul Slade

2012 HOLM Technical Program Committee

TECHNICAL PROGRAM CHAIR

Rod Martens, TE CONNECTIVITY

TECHNICAL PROGRAM VICE CHAIR

George T. Flowers, AUBURN UNIVERSITY

Milenko Braunovic, MB Interface

Z.K. Chen, CHUGAI USA, LLC

Bella Chudnovsky

Stephen Cole, MOOG COMPONENTS GROUP

Ronald Coutu, Air Force Inst. of Technology

Henry Czajkowski, Rockwell Automation

George Drew, Delphi Packard Electric Systems

Daniel Gagnon, HYDRO QUEBEC IREQ

Gary Haupt, Checon Corporation

Guenther Horn, ElConMat Consulting Associates

Robert Jackson, Auburn University

Chi Leung, Metalor Technologies

Richard Moore, C&K COMPONENTS

Marjorie Myers, TE CONNECTIVITY

Brett Rickett, Molex Inc.

John J. Shea, EATON CORPORATION

Ed Smith III, DERINGER NEY, INC.

Philip Wingert

Gerald Witter, Chugai USA, Inc.

Xin Zhou, EATON CORPORATION

2012 Operating Committee

Thomas J. Schoepf, Chair
Brett Rickett, Vice Chair
Rod Martens, Technical Program Chair
George Flowers, Technical Program Vice Chair
Henry Czajkowski, Finance Chair
Gerald Witter, TC1 Chair
Robert Malucci, TC1 Vice Chair
Chi Leung, Publicity Chair
Paul Slade, Course Instructor/International Rep.
Ed Smith III
John Shea
Z.K. Chen
Xin Zhou

2012 Awards Committee

John McBride
John Shea
Gerald Witter

2012 Prize Paper Award Committee

Marjorie Myers
Gary Haupt
Ed Smith III

2011 - 2012 Associate Editors - CPMT

John McBride
Thomas J. Schoepf
Milenko Braunovic

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 2012 IEEE Holm Conference will include excellent papers authored by outstanding technical people in this field. The international contributors come from Canada, China, France, Germany, Japan, Poland, Switzerland, 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 2012 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

	On/Before Aug. 15	After Aug. 15
Holm Conference Only		
IEEE Member	US\$700	US\$775
Non Member	US\$775	US\$850
Student/Life Member	US\$300	US\$350
Intensive Course Only		
IEEE Member	US\$1200	US\$1400
Non Member	US\$1275	US\$1475
Holm Conference & Intensive Course		
IEEE Member	US\$1700	US\$1900
Non Member	US\$1775	US\$1975

CONFERENCE REGISTRATION HOURS

Sunday, 23 September	4:00PM – 6:00PM
Monday, 24 September	7:00AM – 5:00PM
Tuesday, 25 September	8:00AM – 4:30PM
Wednesday, 26 September	8:00AM – 4:00PM

Registration can be completed online:

<http://www.cvent.com/d/rcqq6k/1Q>

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:

Direct Phone: +1 732 465 6620

Fax: +1 732 465 6447

US and Canada: +1 800 810 4333

Elsewhere: +1 732 465 7810

Email: holmreg@ieee.org

WELCOME RECEPTION

All conference attendees are invited to register early and to attend our welcome reception on Sunday, 23 September from 4:00PM – 6:00PM at the Doubletree by Hilton hotel in Portland, OR.

Hotel Accommodations

58th IEEE Holm Conference on Electrical Contacts & Intensive Course:

The 2012 conference meets in Portland, Oregon at the Doubletree by Hilton hotel, where meeting facilities are well suited to the conference sessions and other activities. The hotel is offering special rates of US\$169 single/double occupancy to conference attendees. Rates are subject to 12.5% tax. To make a reservation please call the Doubletree by Hilton Portland at +1 800 996 0510 and reference group code "2012 HOLM Conference" in order to receive the group rate. The rate is valid until 29 August 2012 at 5:00PM PST. Reservations received after this date will be subject to space and availability.

If you are attending the Intensive Course the sleeping room rate from September 19 – 22 is \$149 single/double occupancy.

Check in time: 3:00PM

Check out time: 12:00PM

Doubletree by Hilton Portland
1000 NE Multnomah
Portland, Oregon 97232
+1 503 281 6111

IEEE receives 10% commission from the hotel on sleeping rooms acquired during the conference.

Transportation From Airport

Taxis and Buses:

Please refer to

http://www.portofportland.com/PDX_Grnd_Trnsprtn.aspx

for additional information regarding the airport and local transportation. The Doubletree by Hilton Portland 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 Doubletree by Hilton Portland are as follows:

Daily Self-Parking: US\$18/day from Su-Thu; \$9.00 Fri-Sat

Valet Parking: US\$22/day

For specific driving directions from the Portland International Airport (PDX), consult Map Quest at www.mapquest.com or call the hotel directly at +1 503.281.6111.

Social Event

Conference Banquet

Portland City Grill
Monday, 24 September 2012
6:00PM



The Portland City Grill is Portland's most popular award winning restaurant with unsurpassed views of the city and the Cascade Mountains from atop the 30th floor. The restaurant is located on 111 SW 5th Ave. 30th Floor, Portland, OR 97204.

Each conference attendee will receive a ticket to attend the social event at the Portland City Grill. 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

2013 Nominations Deadline: 14 December 2012

**THE 59TH IEEE HOLM CONFERENCE
ON ELECTRICAL CONTACTS (2013)**

The 59th IEEE Holm Conference on Electrical Contacts will be held September 22-25, 2013 in Newport, RI USA.

Prospective authors should submit a brief abstract (200 words maximum) online before January 20, 2013. Authors will be notified concerning acceptance of abstracts by February 26, 2013.

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 – holm13

(please use lower case)

Important Dates

20 January 2013	Abstract Deadline
26 February 2013	Notification of Acceptance
22 June 2013	Completed Final Paper Deadline
22 September 2013	Conference Begins

Correspondence Address

IEEE Meeting & Conference Management
IEEE Holm Conference (2013)
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

Holm Website:

www.ewh.ieee.org/soc/cpmt/tc1/

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 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. Past lecture awardees are listed as follow:

2011	M. Anderson
2010	P. Theisen
2009	F. Muecklich
2008	Th.J. Schoepf
2007	J.V.R. Heberlein
2006	W. Johler
2005	J. A. Wafer
2004	R. S. Mroczkowski
2003	N. L. Traub
2002	W. H. Abbott

2012 Morton Antler Lecture Computational materials science – **From Atoms To Structures**

Markus J. Buehler

Massachusetts Institute of Technology, Cambridge, MA

Abstract:

Materials are designed from the bottom up by using a close coupling of experiment and powerful computations to generate a new class of materials, atom by atom. Imagine the ability to integrate powerful concepts of living organisms - self-organization, ability to selfheal, and flexibility to create astounding properties from inexpensive and abundant materials. The use of the world's fastest supercomputers allows us to predict properties of complex materials from first principles, realized in a multi-scale modeling approach that spans massive ranges in scale. A comprehensive review of design applications is presented for: 1. structural materials, bone and light weight composites, 2. electronic applications as thin metal films, and 3. multifunctional sensors for temperature and stress measurement.

Markus J. Buehler is an Associate Professor in the Department of Civil and Environmental Engineering at the Massachusetts Institute of Technology (MIT), where he directs the Laboratory for Atomistic and Molecular Mechanics (LAMM). He is the Co-Director of the MIT Computation for Design and Optimization Program, Director of the MIT-Germany Program, and leads the Mechanics and Materials Group in the Department of Civil and Environmental



Engineering. Buehler has published more than 190 articles on computational materials science, nanotechnology and nanoscience, authored two monographs, and given several hundred invited, keynote and plenary talks. Buehler received the National Science Foundation CAREER award, the United States Air Force Young Investigator Award, the Navy Young Investigator Award, and the DARPA Young Faculty Award, as well as the Presidential Early Career Award for Scientists and Engineers (PECASE). He was an invitee and plenary speaker at the National Academy of Engineering-Frontiers in Engineering Symposium. He recently received the Harold E. Edgerton Faculty Achievement Award for exceptional distinction in teaching and in research or scholarship, the highest honor bestowed on young MIT faculty. Other major awards include the Materials Research Society Outstanding Young Investigator Award, the Society of Engineering Science Young Investigator Medal, the Thomas J.R. Hughes Young Investigator Award, the Sia Nemat-Nasser Medal, the Rossiter W. Raymond Memorial Award, the Stephen Brunauer Award, the Alfred Noble Prize, and the Leonardo da Vinci Award. Buehler serves as a member of the editorial board of several international publications including: Roy. Soc. Interface, PLoS ONE, Int. J. Appl. Mech., Acta Mech. Sinica, J. Mech. Beh. Biomed. Mat., J. of Engrg. Mech., J. Nanomech. Micromech, J. Comp. and Theor. Nanosci. and BioNanoScience (as Editor-in-Chief). He is the founding chair of the Biomechanics Committee at the Engineering Mechanics Institute of ASCE, a member of the U.S. National Committee on Biomechanics, and Co-Chair of the Nanoengineering in Biology in Medicine Steering Committee of ASME.

**Supporters of
The 58th IEEE Holm
Conference on
Electrical Contacts**

Platinum Level

CHECON Corporation

Gold Level

Chugai USA LLC

DODUCO GmbH

TE Connectivity

Silver Level

Contact Technologies, Inc.

Deringer Ney, Inc.

Eaton Corporation

Metalor Technologies Americas

NAECO, LLC

Bronze Level

Molex, Inc.

Moog Components Group

Rockwell Automation

Technical Program

MONDAY, 24 SEPTEMBER 2012

8:15AM

INTRODUCTION AND OPENING REMARKS

Thomas Schoepf, 2012 IEEE Holm Conference Chair

8:25AM – 9:25AM

MODELING I

CHAIR: G. WITTER

CO-CHAIR: ZK CHEN

- 1.1 An Analysis of the Scale Dependent and Quantum Effects on Electrical Contact Resistance Between Rough Surfaces**
Robert Jackson, Auburn University, United States; Erika Crandall, Auburn University, United States; and Michael Bozack, Auburn University, United States
- 1.2 Phenomena at Arc Root Immobility in Electrical Contacts**
Stanislav Kharin, Kazakh-British Technical University, Kazakhstan; Hassan Nouri, University of the West of England, United Kingdom; and Bogdan Miedzinski, Wroclaw University of Technology, Poland
- 1.3 The Influence of Thermal Expansion and Plastic Deformation on a Thermo-Electro Mechanical Spherical Asperity Contact**
Hamed Ghaednia, Auburn University, United States; Robert Jackson, Auburn University, United States; and Amir Rostami, Auburn University, United States

9:25AM – 9:45AM

BREAK

9:45AM– 11:25AM

YOUNG INVESTIGATOR AWARD

CHAIR: B. MALUCCI

CO-CHAIR: B. RICKETT

- 2.1 Quantitative Evolution of Electrical Contact Resistance Between Aluminum Thin Films**
David Mercier, CEA - LETI, France; Vincent Mandrillon, CEA - LETI, France; Anthony Holtz, CEA - LETI, France; Fabien Volpi, SIMaP, France; Marc Verdier, SIMaP, France; and Yves Brechet, SIMaP, France

- 2.2 Characterization of Intermetallic Compounds in Al-Cu Bimetallic Interfaces**
Stephanie Pfeifer, Technische Universität Dresden, Germany; Steffen Großmann, Technische Universität Dresden, Germany; Renate Freudenberger, Forschungsinstitut für Edelmetalle und Metallchemie, Germany; Heidi Willing, Forschungsinstitut für Edelmetalle und Metallchemie, Germany; and Herbert Kappl, Forschungsinstitut für Edelmetalle und Metallchemie, Germany
- 2.3 Principle of Arc Fault Detection for Solid State Power Controller**
Jonathan Andrea, Esterline Power Systems, France; Marc Bournat, Esterline Power Systems, France; and Olivier Zirn, Esterline Power Systems, France
- 2.4 Breakdown Electric Field Calculation of Hot SF6 and its Application to High Voltage Circuit Breakers**
Xingwen Li, Xi'an Jiaotong University, China; Hu Zhao, Xi'an Jiaotong University, China; Xu Jiang, Xi'an Jiaotong University, China; Shenli Jia, Xi'an Jiaotong University, China; and Qian Wang, Xi'an Jiaotong University, China
- 2.5 Contact Bounce Phenomena in a MEM Switch**
Alexis Peschot, CEA, LETI, France; Christophe Poulain, CEA, LETI, France; Nelly Bonifaci, CNRS, France; and Olivier Lesaint, CNRS, France

11:25AM – 1:15PM

LUNCH ON OWN

1:15PM – 2:15PM

CONNECTORS

CHAIR: B. RICKETT

CO-CHAIR: G. FLOWERS

- 3.1 Evaluation of Crimping as a Termination Technique for Carbon Nanotube Macro-structures**
Jessica Hemond, TE Connectivity, United States; Rod Martens, TE Connectivity, United States; and Andrew Loyd, TE Connectivity, United States

3.2 The Effect of Wiping Distance on Contact Performance

Xue-Yan Lin, Research Laboratory of Electrical Contacts and Connectors, China; Da Wang, Beijing University of Posts and Telecommunications (BUPT), China; Hui-Juan Long, Beijing University of Posts and Telecommunications (BUPT), China; and Xiao-Lan Ye, Beijing University of Posts and Telecommunications (BUPT), China

3.3 Novel Helical Spring Contact for Low Force & Fine Pitch Applications

Gregory Pawlikowski, TE Connectivity, United States; and Jeffery Mason, TE Connectivity, United States

2:15PM – 2:35PM

BREAK

2:35PM – 3:35PM

TESTING AND CHARACTERIZATION

CHAIR: G. DREW

CO-CHAIR: G. HAUPT

4.1 Selection Criteria for Residential Aluminum Connections

Jesse Aronstein, Consulting Engineer, United States; and Doug Lee, U.S. Consumer Product Safety Commission, United States

4.2 Novel Reflectometry Method Based on Time Reversal for Cable Aging Characterization

Lola El Sahmarany, CEA-LIST Nano-Innov, France; Fabrice Auzanneau, CEA-LIST Nano-Innov, France; and Pierre Bonnet, Blaise Pascal University, France

4.3 An Experimental Study on Contact Resistance Characteristics of Relay Contacts Operated in the Vicinity of New Telechelic Polyacrylate Polymers

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

3:35PM – 3:55PM

BREAK

3:55PM – 4:55PM

ARC FAULT SAFETY

CHAIR: J. SHEA

CO-CHAIR: H. CZAJKOWSKI

5.1 Application of (Motor Protection) Circuit Breakers in Combination with Variable Frequency Drives (VFD)

Hans Weichert, Rockwell Automation AG, Aarau, Switzerland; Pascal Benz, Rockwell Automation AG, Aarau, Switzerland; and Sandro Liberto, Rockwell Automation AG, Aarau, Switzerland

5.2 Diagnostic of Connector's Degradation Level by Frequency Domain Reflectometry

Florent Loete, LGEP-SUPELEC, France; and Cedric Gilbert, LGEP-SUPELEC, France

5.3 Modeling of a Domestic Electrical Installation to Arc Fault Detection

Jinmi Lezama, Université de Lorraine - Hager Electro SAS, France; Patrick Schweitzer, Université de Lorraine, France; Serge Weber, Université de Lorraine, France; Etienne Tisserand, Université de Lorraine, France; and Patrice Joyeux, Hager Electro SAS, France

6:00PM

SOCIAL – PORTLAND GRILL

TUESDAY, 25 SEPTEMBER 2012

8:30AM – 9:50AM

CONTACT FINISH I

CHAIR: E. SMITH

Co-CHAIR: R. COUTU

- 6.1 **The Effects of Lubrication on Electroplated Tin Surfaces: A Systematic Approach by DOE-Methodology**
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
- 6.2 **Graphene Films for Corrosion Protection of Gold Coated Cuprous Substrates in View of an Application to Electrical Contacts**
Sophie Noel, Supelec, France; Laurent Baraton, Supelec, France; David Alamarguy, Supelec, France; Alexandre Jaffre, Supelec, France; Pascal Viel, CEA, France; and Serge Palacin, CEA, France
- 6.3 **New Corrosion Resistant Plating to Reduce Gold Consumption in Connectors**
George J. S. Chou, TE Connectivity, United States
- 6.4 **Whisker Prevention Using Hard Metal Cap Layers**
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

9:50AM – 10:10AM

BREAK

10:10AM – 11:10AM

MORT ANTLER LECTURE

Computational materials science – From Atoms to Structures

Markus J. Buehler, MIT

11:10AM – 11:30PM

BREAK

11:30AM – 12:30PM

DEGRADATION

CHAIR: M. MYERS

CO-CHAIR: S. NOEL

- 7.1 Research on Accelerated Storage Degradation Testing for Aerospace Electromagnetic Relay**
Zhaobin Wang, Harbin Institute of Technology, China; Guofu Zhai, Harbin Institute of Technology, China; Wanbin Ren, Harbin Institute of Technology, China; Xiaoyi Huang, Harbin Institute of Technology, China; and Qiong Yu, Harbin Institute of Technology, China
- 7.2 Degradation Phenomenon of Electrical Contacts Using a Micro-Sliding Mechanism- Minimal Sliding Amplitudes Estimated Under Some Conditions by the Mechanism**
Shin-ichi Wada, TMC System Co. Ltd., Japan; and Koichiro Sawa, Nippon Institute of Technology, Japan
- 7.3 Reliability Study of Low Normal Force LGA Sockets**
Rod Martens, TE Connectivity, United States; Simon Li, TE Connectivity, China; Coosy Ding, TE Connectivity, China; and Nathan Norris, TE Connectivity, United States

12:30PM – 1:50PM

AWARDS LUNCHEON

1:50PM – 3:10PM

ARCING MATERIALS

CHAIR: G. HAUPT

CO-CHAIR: G. HORN

- 8.1 Silver Tungsten VS Silver Tungsten Carbide Contact Performance in Environmental Testing**
Chad Mittelstadt, Schneider Electric, United States
- 8.2 A Study of Contact Endurance Switching Life as a Function of Contact Bond Quality, Contact Electrical Load and Residual Stresses for Silver Tin Indium Oxide Composite Rivet Contacts**
Zhuanke Chen, Chugai USA LLC, United States
- 8.3 Contact Material Combinations for High Performance Switching Devices**
Timo Mützel, Umicore AG & Co. KG, Germany; and Ralf Niederreuther, Umicore AG & Co. KG, Germany

8.4 Effect of Ambient Temperature and Contact Force on Contact Resistance and Overtemperature Behaviour for Power Engineering Contacts

Volker Behrens, Doduco GmbH, Germany; Edgar Siegle, Doduco GmbH, Germany; Jonas Schreiber, Doduco GmbH, Germany; Thomas Honig, Doduco GmbH, Germany; and Michael Finkbeiner, Doduco GmbH, Germany

3:10PM – 3:30PM

BREAK

3:30PM – 4:30PM

FRETTING

CHAIR: G. FLOWERS

CO-CHAIR: D. GAGNON

9.1 Introduction of a "Modified Archard Wear Law" to Predict the Electrical Contact Endurance of Thin Plated Silver Coatings Subjected to Fretting Wear

Siegfried Fouvry, Ecole Centrale de Lyon, France; Pawel Jedrzejczyk, Ecole Centrale de Lyon, France; Olivier Perrinet, Ecole Centrale de Lyon, France; Olivier Alquier, PSA, France; and Pierre Chalandon, PSA, France

9.2 Fretting Behavior of Au Plated Copper Contacts Induced by High Frequency Vibration

Wanbin Ren, Harbin Inst. of Tech., China; Li Cui, G&A Technology Co., Ltd, China; Jinbao Chen, Harbin Inst. of Tech., China; Xiaoming Ma, Harbin Inst. of Tech., China; and Xinyun Zhang, Harbin Inst. of Tech., China

9.3 Sliding Performance of Electrical Contact Pairs with Inconsistently Thick Gold Plating

Yilin Zhou, Beijing University of Posts and Telecommunications, China; Chuan Hong, Beijing University of Posts and Telecommunications, China; Libiao Liu, Beijing University of Posts and Telecommunications, China; and Liangjun Xu, Beijing University of Posts and Telecommunications, China

4:30PM – 4:50PM

BREAK

4:50PM

TC1 MEETING

WEDNESDAY, 26 SEPTEMBER 2012

8:30AM – 9:30AM

MODELING II

CHAIR: T. SCHOEPF

CO-CHAIR: X. ZHOU

10.1 Finite Element Based Surface Roughness Study for Ohmic Contact of Microswitches

Hong Liu, Institut Clément Ader, INSA, Univ de Toulouse; CNRS, LAAS; Univ de Toulouse, INSA, LAAS, France; Dimitri Leray, Institut Clément Ader, INSA, Univ de Toulouse; CNRS, LAAS; Univ de Toulouse, INSA, LAAS, France; Patrick Pons, CNRS, LAAS; Univ de Toulouse, LAAS, France; Stéphane Colin, Institut Clément Ader, INSA, Univ de Toulouse, France; and Adrien Broué, NOVAMEMS, c/o CNES; CNRS, LAAS ; Univ de Toulouse, LAAS, France

10.2 The Steady Temperature Rise Analysis of Non Segregated Phase Bus based on Finite Element Method

Jiixin You, Harbin Institute of Technology, China; Huimin Liang, Harbin Institute of Technology, China; Guangcheng Ma, Harbin Institute of Technology, China; Guoliang Li, Harbin Electric Machinery Co. LTD, China; and Guofu Zhai, Harbin Institute of Technology, China

10.3 Role of Metallic Vapor Pressure in Contact Bouncing and Welding at Closure of Electrical Contacts in Vacuum

Stanislav Kharin, Kazakh-British Technical University, Kazakhstan

9:30AM – 9:50AM

BREAK

9:50AM – 10:50AM

FUNDAMENTALS

CHAIR: R. JACKSON

CO-CHAIR: B. MALUCCI

11.1 Current Density Analysis of Thin Film Effect in Contact Area on LED Wafer

Shigeru Sawada, Mie Univ. Graduate School of Engineering, Japan; Shigeki Tsukiji, Mie Univ. Graduate School of Engineering, Japan; Shigeki Shimada, Sumitomo Electric Industries LTD., Japan; Terutaka Tamai, Elcontech Consulting, Japan; and Yasuhiro Hattori, Autonetworks Technologies Ltd., Japan

11.2 Contact Resistance Reduction by Matching Current and Mechanical Load Carrying Asperity Junctions
Marjorie Myers, TE Connectivity, United States; Michael Leidner, TE Connectivity, Germany; Helge Schmidt, TE Connectivity, Germany; Soenke Sachs, TE Connectivity, Germany; and Alexander Baeumer, TE Connectivity, Germany

11.3 Current Redistribution across an Aging Contact Interface
Robert Malucci, RD Malucci Consulting, United States

10:50AM – 11:10AM
BREAK

11:10AM – 12:10PM
CONTACT FINISH II
CHAIR: R. COUTU
CO-CHAIR: M. MYERS

12.1 Electrochemically Deposited Coating Systems on Aluminum for Contact Applications
Stephanie Kissling, DODUCO GmbH, Germany; Wolfgang Schmitt, DODUCO GmbH, Germany; and Volker Behrens, DODUCO GmbH, Germany

12.2 Electrical Contact Resistance Presumption about Tin-Coated Copper-Alloy Contacts Using RF Sputtered SnOx Thin Films
Keiji Mashimo, Furukawa Electric Co., Ltd., Japan; and Yasuyuki Ishimaru, FITEC Corp., Japan

12.3 The Influence of Surface Oxides on Whiskering
Erika Crandall, Auburn University, United States; George Flowers, Auburn University, United States; Pradeep Lall, Auburn University, United States; Erica Snipes, Auburn University, United States; and Michael Bozack, Auburn University, United States

12:10PM – 1:10PM
LUNCH ON OWN

1:10PM – 2:30PM

ARCING

CHAIR: P. SLADE

CO-CHAIR: ZK CHEN

13.1 Observation of Changes of Contact Surface Profiles of Ag and AgSnO₂ Contacts During Switching Operations with an Optical Cross-Section Method

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

13.2 Influence of Source Voltage on Various Characteristics of a Contactor Comparing Make Only, Break Only and Make and Break Arcs

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

13.3 High-Speed Spectroscopic Imaging of Contact Surfaces Eroded by Break Arcs

Junya Sekikawa, Shizuoka University, Japan

13.4 A Type of Attractive Force Calculation Model of Polarized Relay Based on Nonlinear Permanent Magnet Bar Subsection Model

Huimin Liang, Harbin Institute of Technology, China; Jiaxin You, Harbin Institute of Technology, China; Weinan Xie, Harbin Institute of Technology, China; Guangcheng Ma, Harbin Institute of Technology, China; and Guofu Zhai, Harbin Institute of Technology, China

2:30PM – 2:50PM

BREAK

2:50PM – 4:10PM

SLIDING

CHAIR: E. SMITH

CO-CHAIR: C. LEUNG

14.1 Time Series Analysis in the Study of Sliding Electrical Contacts

Christian Holzapfel, Schleifring und Apparatebau GmbH, Germany

14.2 Influence of Arc Discharge on Carbon Commutator and Brush Wear in DC Motor Driving Fuel Pump

Koichiro Sawa, Nippon Institute of Technology, Japan; Liqing Liu, Nippon Institute of Technology, China; and Takahiro Ueno, Nippon Institute of Technology, Japan

14.3 Sliding Scar Analyses of High Speed Sliding Contact Characteristics of Cu-Sn Based Composite Materials Containing WS₂

Yoshitada Watanabe, Kogakuin University, Japan; and Ryohei Saito, Union Machinery Company, Japan

14.4 High Speed Data across Sliding Electrical Contacts

Glenn Dorsey, Moog, Inc., United States; Donnie Coleman, Moog, Inc., United States; and Barry Witherspoon, Moog, Inc., United States

4:10PM

CLOSING REMARKS

Thomas Schoepf

Author Index

Alamarguy, David	16	Hasegawa, Makoto	14, 21
Alquier, Olivier	18	Hattori, Yasuhiro	19
Ando, Hiroshi	21	Hemond, Jessica	13
Andrea, Jonathan	13	Holtz, Anthony	12
Aronstein, Jesse	14	Holzappel, Christian	22
Auzanneau, Fabrice	14	Hong, Chuan	18
		Honig, Thomas	18
Baeumer, Alexander	20	Huang, Xiaoyi	17
Baraton, Laurent	16		
Behrens, Volker	18, 20	Ishimaru, Yasuyuki	20
Benz, Pascal	15		
Bonifaci, Nelly	13	Jackson, Robert	12 (2)
Bonnet, Pierre	14	Jaffre, Alexandre	16
Bournat, Marc	13	Jedrzeczyk, Pawel	18
Bozack, Michael	12, 16, 20	Jia, Shenli	13
Brechet, Yves	12	Jiang, Xu	13
Broué, Adrien	19	Joyeux, Patrice	15
Chalandon, Pierre	18	Kappl, Herbert	13
Chen, Jinbao	18	Kharin, Stanislav	12, 19
Chen, Zhuanke	17	Kissling, Stephanie	20
Chou, George J. S.	16	Kobayashi, Nanae	21
Coleman, Donnie	22	Kohno, Yoshiyuki	21
Colin, Stéphane	19		
Crandall, Erika	12, 16, 20	Lall, Pradeep	16, 20
Cui, Li	18	Lee, Doug	14
		Leidner, Michael	20
Daijima, Hideki	21	Leray, Dimitri	19
Ding, Coosy	17	Lesaint, Olivier	13
Dorsey, Glenn	22	Lezama, Jinmi	15
		Li, Guoliang	19
El Sahmarany, Lola	14	Li, Simon	17
		Li, Xingwen	13
Finkbeiner, Michael	18	Liang, Huimin	19, 21
Flowers, George	16, 20	Liberto, Sandro	15
Fouvry, Siegfried	18	Lin, Xue-Yan	14
Freudenberger, Renate	13	Liu, Hong	18
		Liu, Libiao	18
Ghaednia, Hamed	12	Liu, Liqing	22
Gilbert, Cedric	15	Loete, Florent	15
Großmann, Steffen	13	Long, Hui-Juan	14
		Loyd, Andrew	13

Author Index

Ma, Guangcheng	19, 21	Siegle, Edgar	18
Ma, Xiaoming	18	Snipes, Erica	20
Malucci, Robert	20 (2)	Suzuki, Kenji	21
Mandrillon, Vincent	12		
Martens, Rod	13, 17	Takahashi, Keisuke	14
Mashimo, Keiji	20	Takaya, Kouetsu	21
Mason, Jeffery	14	Tamai, Terutaka	19
Mercier, David	12	Tisserand, Etienne	15
Miedzinski, Bogdan	12	Tsukiji, Shigeki	19
Mittelstadt, Chad	17		
Mützel, Timo	17	Ueno, Takahiro	22
Myers, Marjorie	20		
		Verdier, Marc	12
Niederreuther, Ralf	17	Viel, Pascal	16
Noel, Sophie	16	Volpi, Fabien	12
Norris, Nathan	17		
Nouri, Hassan	12	Wada, Shin-ichi	17, 19
		Wang, Da	14
Ostendorf, Frank	16	Wang, Qian	13
		Wang, Zhaobin	17
Palacin, Serge	16	Watanabe, Yoshitada	22
Pawlikowski, Gregory	14	Weber, Serge	15
Perrinet, Olivier	18	Weichert, Hans	15
Peschot, Alexis	13	Wielsch, Thomas	16
Pfeifer, Stephanie	13	Willing, Heidi	13
Pons, Patrick	19	Witherspoon, Barry	22
Poulain, Christophe	13		
		Xie, Weinan	21
Reiniger, Michael	16	Xu, Liangjun	18
Ren, Wanbin	17, 18		
Rostami, Amir	12	Ye, Xiao-Lan	14
		Yoshida, Kiyoshi	21
Sachs, Soenke	20	You, Jiaxin	19, 21
Saito, Ryohei	22	Yu, Qiong	17
Sawa, Koichiro	17, 21, 22		
Sawada, Shigeru	19	Zhai, Guofu	17, 19, 21
Schmidt, Helge	20	Zhang, Xinyun	18
Schmitt, Wolfgang	20	Zhao, Hu	13, 17
Schreiber, Jonas	18	Zhou, Yilin	18
Schweitzer, Patrick	15	Zirn, Olivier	13
Sekikawa, Junya	21		
Shimada, Shigeki	19		