

ADVANCE PROGRAM AND REGISTRATION ON-LINE: WWW.IMAPS.ORG/EXTREMECOLD

IMAPS 2nd Advanced Technology Workshop on **RELIABILITY OF ADVANCED ELECTRONIC PACKAGES AND DEVICES IN EXTREME COLD ENVIRONMENTS**

**EMBASSY SUITES HOTEL ARCADIA - PASADENA AREA
ARCADIA, CA - USA
FEBRUARY 27 - MARCH 1, 2007**



Courtesy of JPL/NASA

General Chair:

Dr. Rajeshuni Ramesham
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Sponsored by:

International Microelectronics And Packaging Society (IMAPS)
Bringing Together the Entire Microelectronics Supply Chain!

Early Registration and Hotel Deadline: February 9, 2007

Workshop Overview

The objective of this Advanced Technology Workshop (ATW) is to have a unique technical forum that brings together industrialists, scientists, engineers, space agencies and academia who have been working in the area of advanced electronic package reliability and electronic device reliability in extreme cold to hot temperature environments. Studies in extreme thermal and radiation environments are extended beyond nominal operating temperature regimes and radiation levels. Validation of the electronic packages assembled with various electronic parts over a wide temperature range to infuse into future space missions is of significant value for space applications. The other goal of this ATW is to expedite the infusion of cutting-edge technology into present and future NASA projects, missions, and science instruments. This ATW is partially providing the mechanism to create an international network of electronics developers and systems designers by bringing together representatives from academia and the space agencies. This Workshop covers active and passive devices, circuits/systems, advanced packaging, instruments, and reliability under extreme cold to hot temperatures, and radiation environments. This is the second workshop in a series that is being organized in the USA since there is a significant interest for NASA and other space agencies in missions to Mars, the Moon, Deep Space Missions and beyond.

Tuesday, February 27th

Registration: 7:00 am - 7:00 pm

Continental Breakfast: 7:15 am - 8:15 am

Opening Remarks: 8:15 am

Workshop General and Technical Chairs

KEYNOTE PRESENTATION: 8:30 AM - 9:30 AM

TITLE: MER PROJECT: STEALING SUCCESS
FROM THE JAWS OF FAILURE

SPEAKER: ROBERT M. MANNING, NASA / JET PROPULSION
LABORATORY

Robert M. Manning is Chief Engineer for the Mars Exploration Directorate where he supports current and future missions to Mars. Rob was Systems Engineering Manager and Entry, Descent and Landing (EDL) Development Manager for the MER Project. Since joining JPL in 1980, Rob was Chief Engineer for the 1997 Mars Pathfinder Project, and also developed computers and fault tolerant electronic systems for JPL's deep space missions, including the Cassini and Galileo Projects. He is a graduate of both Caltech (BS '82) and Whitman College (BA '80), where he studied mathematics, physics, computer science and control systems.

SESSION 1: TECHNOLOGY TO LIQUID HELIUM TEMPERATURES FOR SPACE APPLICATIONS

Chairs: Chris van Hoof, IMEC; Patrick Merken, IMEC
9:30 am - Noon

Development and Manufacture of a Linear 16 Pixel FIR Array - the PACS Module

Hilmar H. Richter, Michael Harr, Peter Dinges, Heribert Krüger, Alexandra Todisco, Bernd Zimmermann, ASTEQ GmbH

Flight Qualification of Sensor Front-End Electronics for PACS/Herschel at Liquid Helium Temperature

Patrick Merken, T. Souverijns, J. Putzeys, C. Van Hoof, IMEC

Break: 10:30 am - 11:00 am

Cryogenic Analog-to-Digital Converters Operational from Room Temperature Down to 4.2K

Ybe Creten, Patrick Merken, Robert Mertens, Willy Sansen, Chris Van Hoof, IMEC

Extreme Temperature Invariant Circuitry Through Adaptive Body Biasing and Supply Voltage Scaling

Wallace Shepherd Pitts, Vinayak Devasthali, Paul D. Franzon, John Damiano, North Carolina State University

Lunch: Noon - 1:15 pm

LUNCH SPEAKER: 12:30 PM - 1:15 PM

TITLE: MARS EXPLORATION ROVER SURFACE MISSION
FLIGHT THERMAL PERFORMANCE

SPEAKER: KEITH NOVAK, CHARLES PHILLIPS, ERIC SUNADA,
GARY KINSELLA, JET PROPULSION LABORATORY

SESSION 2: DEVICES AND THEIR RELIABILITY FOR EXTREME TEMPERATURES

Chairs: Richard Patterson, NASA Glenn Research Center;
Malik Elbuluk, University of Akron
1:15 pm - 5:00 pm

Reliability of Cryogenic Power Electronics Components

E. K. Mueller, M. J. Hennessy, O. Mueller, R. R. Neal, A. E. Libby, P. J. Steffan, W. J. Wilson, MTECH Laboratories, LLC

Electronics for Low Temperature Space Exploration Missions

Richard L. Patterson, NASA Glenn Research Center; Ahmad Hammoud, ASRC Corp. at NASA Glenn Research Center; Malik Elbuluk, University of Akron

SiGe Diodes for Cryogenic Power Electronics

Rufus R. Ward, W. J. Dawson, L. Zhu, R. K. Kirschman, GPD Optoelectronics Corp.; G. Niu, R. M. Nelms, Auburn University; O. Mueller, LTE-Low Temperature Electronics; M. J. Hennessy, E. K. Mueller, MTECH Laboratories LLC

Break: 2:45 pm - 3:00 pm

Ultra Low Temperature Testing of an Ultra Low Power CMOS Synchronously Clocked Complex Logic Circuit

Ronald O. Nelson, Muzar Jah, Sterling Whitaker, Pen-Shu Yeh, University of Idaho

Characterization of SOI Industrial Circuits from -195°C to 300°C

Laurent Demeûs, Vincent Dessard, Gonzalo Picun, Pierre Delatte, Lucien Marechal, CISSOID. S.A.; Richard Patterson, NASA Glenn Research Center; Ahmad Hammoud, ASRC Corp. at NASA Glenn Research Center

Assessment of SOI Integrated Circuits at Extreme Temperatures

Malik Elbuluk, University of Akron; Ahmad Hammoud, ASRC Corp. at NASA Glenn Research Center; Richard L. Patterson, NASA Glenn Research Center

Reliability of Indium Attach in Low Temperature Packaging for Space Applications

F. Patrick McCluskey, Rui Wu, University of Maryland

Welcome Reception/Dinner: 5:00 pm - 7:00 pm

DINNER SPEAKER: 6:15 PM - 7:00 PM

TITLE: CRYOELECTRONICS AND THEIR USE IN THE JWST OPTICAL
TELESCOPE ELEMENT CONTROL ELECTRONICS

SPEAKER: SANDOR DEMOSTHENES, RANDY ABBOTT, BALL AERO-
SPACE & TECHNOLOGIES CORP.

Wednesday, February 28th

Registration: 7:30 am - 4:15 pm

Continental Breakfast: 7:30 am - 8:30 am

KEYNOTE PRESENTATION: 8:30 AM - 9:10 AM

TITLE: EXTREME TEMPERATURE ELECTRONICS BASED ON SELF-ADAPTIVE SYSTEM USING FIELD PROGRAMMABLE GATE ARRAY

SPEAKER: DIDIER KEYMEULEN, RICARDO ZEBULUM, RAMESHAM RAJESHUNI, ADRIAN STOICA, **JET PROPULSION LABORATORY**; SRINIVAS KATKOORI, UNIVERSITY OF SOUTH FLORIDA; SHARON GRAVES, FRANK NOVAK, CHARLES ANTILL, NASA LARC

Didier Keymeulen received his BSEE, MSEE and Ph.D. in Electrical Engineering and Computer Science from the Free University of Brussels, Belgium in 1994. In 1996 he joined the computer science division of the Japanese National Electrotechnical Laboratory, Tsukuba, Japan as senior researcher. Since 1998 he is member of the technical staff of JPL in the Autonomous Division. At JPL, he is responsible for the applications of evolvable hardware for adaptive computing that leads to the development of fault-tolerant electronics and autonomous and adaptive sensor technology. He has served as the chair, co-chair, and program-chair of NASA/DoD Conferences on Evolvable Hardware.

SESSION 3: LOW/HIGH TEMPERATURE TECHNOLOGY FOR SPACE APPLICATIONS

Chairs: Chris van Hoof, IMEC; Jay Polk, Jet Propulsion Laboratory
9:10 am - 11:40 am

Low Temperature Lithium Ion Batteries for Mars Missions
Ratnakumar Bugga, Marshall Smart, Rao Surampudi, Jet Propulsion Laboratory

Thermal Cycle Lifetest of Swaged Cathode Heaters
Jay Polk, Rajeshuni Ramesham, Jet Propulsion Laboratory

Break: 10:10 am - 10:40 am

Thermal Energy Storage Technology Developments
Michael Pauken, Nick Emis, Brenda Watkins, Jet Propulsion Laboratory

Temperature Compensation of Calorimetric Flow Sensor using Wheatstone Bridge Circuit
Dongwoo Han, Sekwang Park, Kyungpook National University

Lunch: Noon - 1:00 pm

LUNCH SPEAKER: 12:30 PM - 1:15 PM

TITLE: TITAN AND ENCELADUS MISSION OVERVIEW
SPEAKER: KIM R. REH, **JET PROPULSION LABORATORY**

SESSION 4: FPGAs FOR EXTREME LOW TEMPERATURES

Chairs: Srinivas Katkooori, University of South Florida; Gary M. Swift, Jet Propulsion Laboratory / Caltech
1:15 pm - 4:15 pm

An FPGA-Based Computer Platform for Space Applications
Gary M. Swift, Jet Propulsion Laboratory / Caltech

Field Programmable Gate Arrays (FPGAs) in Extreme Environments - A Survey
Srinivas Katkooori, University of South Florida; Adrian Stoica, Didier Keymeulen, Ricardo Zebulum, Rajeshuni Ramesham, Jet Propulsion Laboratory

Break: 2:15 pm - 2:45 pm

Single Effective Gate: Distributive Computation in Noisy Environments
Joseph Neff, SPAWAR Systems Center

Coupling Induced Oscillations in Bistable Systems and Applications
Visarath In, SPAWAR Systems Center

High Reliability FPGAs for Space Applications
Ravi Pragasam, Actel Corporation

Reception: 4:30 pm - 5:30 pm

Thursday, March 1st

Registration: 7:30 am - Noon

Continental Breakfast: 7:30 am - 8:30 am

KEYNOTE PRESENTATION: 8:30 AM - 9:00 AM

TITLE: TBD
COMPANY: TEXAS INSTRUMENTS

SESSION 5: RELIABILITY, PACKAGING, AND QUALIFICATION

Chairs: Kin Fung Man, Jet Propulsion Laboratory; Rajeshuni Ramesham, Jet Propulsion Laboratory
9:00 am - Noon

Qualification of Hardware for JPL/NASA Projects Under Extreme Temperatures to Assess Reliability and to Enhance Mission Assurance
Rajeshuni Ramesham, Justin N. Maki, Gordon C. Cucullu, Jet Propulsion Laboratory

Cryogenic Detection Circuit for a Fourier Transform Mass Spectrometer
Raman Mathur, Ronald W. Knepper, Peter B. O'Connor, Boston University

Testing of the Mars Exploration Rovers to Survive the Extreme Thermal Environments
Kin Fung Man, Alan R. Hoffman, Jet Propulsion Laboratory

Break: 10:30 am - 11:00 am

Improved Electric Characterization to Compared Nitride Deposition with other Material for Passivation on Engine Oil Sensor
Suwon Cho, Sekwang Park, Kyungpook National University

Low Temperature, Thermal Cycle Electronic Packaging Survivability Study for Brushless Motor Drive Electronics
Carissa D. Tudryn, Elizabeth Kolawa, Don Schatzel, Andrew Shapiro, Jong-Ook Suh, Kirk Bonner, Chuck Derksen, Tosh Hatake, Atul Mehta, Anarosa Villanueva, Jet Propulsion Laboratory, California Institute of Technology

Closing Remarks: Noon

REGISTRATION FORM

REGISTER ON-LINE AT WWW.IMAPS.ORG/EXTREMECOLD
EXTREME COLD ATW - FEBRUARY 27 - MARCH 1, 2007

Dr. Mr. Ms. Member ID# _____
First Name _____ M.I. _____ Last Name _____
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REGISTRATION FEES: EARLY REGISTRATION ENDS 2/9/07

WORKSHOP FEES

(On or before 2/9) (After 2/9)

- Member (IMAPS) \$565 \$665
 Non-member* \$665 \$765

*Includes one-year IMAPS individual membership.

- Speaker Student Chair \$350 \$450
 Government Employee Chapter Officers \$350 \$450

Workshop Fee includes an Abstract Book, all meals listed and a CD of Presentations. CD of Presentations will be mailed 10 business days after the event.

ADDITIONAL PURCHASES

- Guest/Family Member (meals only) \$150 \$150
 CD of Presentations (Member Rate) \$150 \$150
 CD of Presentations (Non-Member Rate) \$275 \$275
 Add to Ship in the US \$7 \$7
 Add to Ship Overseas \$25 \$25

Housing (Hotel Cut-off is February 9, 2007)

Housing Accommodations **must** be made directly to:

Embassy Suites Arcadia - Pasadena

211 East Huntington Drive

Arcadia, CA 91006

P: 1-800-362-2779 or 626-445-8525

Please reference IMAPS when making reservation.

Single/Double: \$155

Embassy Suites requires a deposit for the first night's room and tax to hold your room. Deposit refunded if reservation is cancelled fourteen (14) days prior to arrival, after which deposit is non-refundable.



International Microelectronics And Packaging Society (IMAPS)
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PAYMENT

Workshop Fee: \$ _____

Additional Purchases: \$ _____

Total Payment Due: \$ _____

Enclosed is a check payable in US funds to IMAPS

Charge my fees to:

Visa MasterCard Discover Amex Diners Club

Card# _____ Exp. _____

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Card billing address, if different from above: (required)

E-mail address required to receive confirmation of registration.

For Wire Transfer information, call 202-548-4001.

Mail this form with payment to: IMAPS * 611 2nd Street, NE * Washington, DC 20002-4909. For credit card transactions, register on-line: www.imaps.org; or register by phone with your credit card by calling 202-548-4001; Fax: 202-548-6115. Additional information? E-mail: IMAPS@imaps.org, or visit our web site: <http://www.imaps.org>. Cancellations will be refunded (less a \$50 processing fee) only if written notice is postmarked on or before **February 9, 2007**. No refunds will be issued after that date.

IMAPS Registration
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