IMAPS International Conference and Exhibition on

High Temperature Electronics

(HiTEC 2006)

May 15 – 18, 2006

Hilton of Santa Fe
Santa Fe, NM

Program Overview

Plenary Session
Chair: Clarence Severt, USAF, AFRL/PRPE

Session TP1: Sensors
Chair: Ali Sayir, NASA Glen Research Center

Session TP2: Packaging I
Chair: Joseph Weimer, Air Force Research Laboratory

Interactive Forum (Poster Session)
Chair: F. Patrick McCluskey, University of Maryland

Session WA1: HT Integrated Circuits I
Chair: Harold Synder, Physical Solutions

Session WA2: Emerging Technologies I
Chair: Don Shiffler, AFRL/DEHP

Session WA3: HT Integrated Circuits II
Chair: Chris Hutchens, Oklahoma State University

Session WA4: Emerging Technologies II
Chair: Jim Scofield, AFRL/PRPE

Session WP1: HT Integrated Circuits III
Chair: Bruce Ohme, Honeywell Defense & Space Electronics Systems

Session WP2: Packaging II
Chair: R. Wayne Johnson, Auburn University

Session THA1: Silicon Carbide Discrete Devices I
Chair: Bruce Geil, Army Research Laboratory

Session THA2: High Temperature Batteries
Chair: David Ryan, Air Force Research Laboratory

Session THA3: Silicon Carbide Discrete Devices II
Chair: Anant Agarwal, Cree, Inc.

Session THA4: Capacitors I
Chair: John Witham, Sandia National Laboratories

Session THP1: Passives & Packaging
Chair: Randy Normann, Sandia National Laboratories

Session THP2: Capacitors II
Chair: Tom Shrout, The Pennsylvania State University/TRS Technologies Inc.

Session THP3: Emerging Technologies III
Chair: Susan Heidger, Air Force Research Laboratory

General Chair:
R. Wayne Johnson, Auburn University
johnson@eng.auburn.edu

General Co-Chair:
Randy Normann, Sandia National Laboratories
ranorma@sandia.gov

Technical Chair:
Patrick McCluskey, University of Maryland
mcclupa@eng.umd.edu

Technical Co-Chair:
Susan L. Heidger, Air Force Research Laboratory
susan.heidger@wpafb.mil

Sponsored by:
International Microelectronics And Packaging Society (IMAPS)
“Everything in electronics between the chip and the system”
The Air Force Research Laboratory, WPAFB
Sandia National Laboratories
Jet Propulsion Laboratory

Advance Program, Exhibition Information and Registration on-line: www.imaps.org/hitec

IMAPS International Conference and Exhibition on High Temperature Electronics (HiTEC 2006)
May 15 – 18, 2006
Hilton of Santa Fe
Santa Fe, NM

Early Bird Registration, Tabletop Registration and Hotel Deadline: April 14, 2006.
**Message from the General Chair:**

The members of the Conference Committee are pleased to invite you to the IMAPS High Temperature Electronics Conference (HiTEC 2006).

This is the premier event addressing the needs of the high temperature electronics community. Applications for high temperature electronics include underhood automotive, oil well logging, geothermal, more electric aircraft, space, industrial sensors, etc.

HiTEC 2006 provides a comprehensive technical program addressing the applications, and the latest development in devices, circuits, MEMS, sensors, packaging, power sources, and materials to address the challenges of these applications.

Tabletop exhibits will complement the technical program by providing you an opportunity to view the latest products for high temperature electronics.

This is a truly unique opportunity for suppliers, fabricators, and users to meet and talk about the needs, issues and opportunities in this exciting and important area.

Please join us in wonderful Santa Fe, New Mexico for HiTEC 2006.

R. Wayne Johnson, Auburn University

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**HiTEC Tabletop Exhibition**

*“An opportunity to talk to industry leaders”*

**Exhibit Hours**

Tuesday - May 16  
10 am - 7:30 pm  
*Refreshment Breaks, Lunch and a Reception will be held in the Exhibit Hall.*

Wednesday - May 17  
10 am - 3:00 pm  
*Refreshment Breaks and Lunch will be held in the Exhibit Hall.*

**Tabletop Registration Fees**

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<th></th>
<th>On/Before 4/14/06</th>
<th>After 4/14/06</th>
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<tbody>
<tr>
<td>IMAPS Corporate Member</td>
<td>$550</td>
<td>$650</td>
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<tr>
<td>Non-Corporate Member</td>
<td>$650</td>
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*Included with your registration: one six ft. draped table, two chairs, carpeting, one copy of Proceedings CD-ROM, one copy of the final list of attendees and exhibit hall admission for two booth personnel.*

Only tabletop exhibits will be accepted. Free standing exhibits will not be allowed at this event.

For more information visit [www.imaps.org/hitec](http://www.imaps.org/hitec) or contact IMAPS at 202-548-4001

**Exhibitors on HiTEC 2006 CD-ROM**

IMAPS will provide all exhibitors an opportunity to provide an unlimited amount of pages of company products, services and contact information to be included on the Proceedings CD-ROM. These CD-ROMs are provided to all technical conference attendees and are for sale through IMAPS to all industry professionals.

This unique feature will promote the Exhibitor’s products and abilities much longer than just the Conference. There is a charge of $50 for this optional feature; go on-line or see the registration page to sign up.

Submissions must be sent electronically in one (1) file, either PDF or Word, that is easy to open, not password-protected and in a logical format. Any materials not sent in the required format or that arrive after the deadline, may not appear on the CD-ROM and no refunds will be made. Send files to Ann Bell [abell@imaps.org](mailto:abell@imaps.org) on or before April 28, 2006.
Monday, May 15

REGISTRATION: 4:00 PM - 6:30 PM

OPENING RECEPTION: 5:15 PM – 6:30 PM

Tuesday, May 16

REGISTRATION: 7:00 AM – 7:30 PM

CONTINENTAL BREAKFAST: 7:00 AM – 8:00 AM

EXHIBIT HOURS: 10:00 AM – 7:30 PM

REFRESHMENT BREAKS, LUNCH AND RECEPTION IN THE EXHIBIT HALL

RECEPTION IN THE EXHIBIT HALL: 5:30 PM – 7:30 PM

OPENING REMARKS: 8:00 AM – 8:10 AM

CONFERENCE CHAIRS

PLENARY SESSION

Chair: Clarence Severt, USAF, AFRL/PRPE
8:10 am – 12:40 pm

Deep Drilling Frontiers Drive Key Technology Advancements
Mike Payne, BP America Inc.

Applications of High Temperature Electronics in Space Exploration
Elizabeth Kolawa, Jet Propulsion Laboratory

A Case for High Temperature Electronics for Aerospace
Ishaque S. Mehdi, Arthur E. Brockschmidt, The Boeing Company; Kamiar J. Karimi, Boeing Commercial Airplanes

BREAK IN EXHIBIT HALL: 10:10 AM – 10:40 AM

High Temperature & Thermal Management Needs for the FreedomCar Program
Laura Marlino, Oak Ridge National Laboratory

HTHV for the Electric Power Grid
Stan Atcitty, Sandia National Laboratories

Development of the Smart Field
Larry Lake, University of Texas

LUNCH IN EXHIBIT HALL: 12:40 PM – 2:00 PM

Conference Proceedings

If you are unable to attend the Conference and would like a copy of the CD-ROM Proceedings, you may purchase a copy by using the registration form. Your copy will be mailed to you after the event.

The cost is $200 for members; $300 for nonmembers,* plus shipping and handling. Reserve your copy on-line at www.imaps.org/hitec or call 202-548-4001.

*includes 1 year IMAPS individual membership.

Conference Hotel

Hilton of Santa Fe
100 Sandoval Street
Santa Fe, NM 87501-2131
Phone: 505-988-2811 or 800-336-3676
www.santafe.hilton.com

Single/Double $159
Please reference IMAPS when making reservation to receive the group rate.
**TP1 - SENSORS**
Chair: Ali Sayir, NASA Glen Research Center
2:00 pm – 5:00 pm

- **Sensor Amplifier for the Venus Ground Ambient**
  Linda Del Castillo, Travis Johnson, Toshio Hatake, Mohammad Mojarradi, Elizabeth Kolawa, Jet Propulsion Laboratory

- **Performance of MEMS-DCA SiC Pressure Transducers under Dynamic Conditions**

- **A Novel Designed Thermal Vacuum / Pressure Sensor**
  Xiaojuan Wang, Laurence P. Sadwick, Jing-Yi Huang, The University of Utah

**BREAK IN THE EXHIBIT HALL: 3:15 PM – 3:45 PM**

- **Layered Structured La₂Ti₂O₇ as a High Temperature Piezoelectric**
  Ali Sayir, Serena C. Farmer, Fred Dynys, NASA Glen Research Center

- **A 300°C Silicon Carbide Light-Off Detector for Aircraft Engines**
  Vijayaraghavan Madhuravasal, Chia Ming Liu, Chriswell Hutchens, Oklahoma State University; Harmik Der Sahakian, John Klasner, Herb Swanson, Technology Development Group

**INTERACTIVE FORUM (POSTER SESSION)**
Chair: F. Patrick McCluskey, University of Maryland
5:30 pm – 7:30 pm

- **Parametric Stability and Failure Mechanisms of Silicon Carbide Pressure Sensors**
  Robert S. Okojie, P. Nguyen, V. Nguyen, E. Savrun, E.L. Benavage, D. Luko, J. Buehler, T. McCue, NASA Glen Research Center

- **Low Power Two-Path Decimation Filter Design and Implementation on Silicon-On-Sapphire (SOS) Process for High Temperature Application**
  Chia-Ming Liu, Chriswell Hutchens, Oklahoma State University

- **High Temperature Silicon on Sapphire (SOS) Analog Circuit Design Techniques and Building Blocks**
  Chriswell Hutchens, Narendra Kayathi, Steven Morris, Chia-Ming Liu, Oklahoma State University

- **Extreme Temperature SOS Varactor Modeling**
  Jianning Wang, Yumin Zhang, Steven A. Morris, Srinivasan Venkataraman, Chris Hutchens, Oklahoma State University

- **Kirchoff’s Law Analysis of GaAs MESFETs and Related Devices at High Temperatures**
  Xiaojuan Wang, Laurence P. Sadwick, The University of Utah

- **Reliability of High Temperature Solder Alternatives**

- **A High Temperature, Small Area Digital Filter on an FPGA**
  Xiaojuan Wang, Laurence P. Sadwick, Oklahoma State University; Randy Normann, Sandia National Laboratories

- **A Room Temperature to 300°C Enhanced Curtice Model with General Applicability to Field Effect Transistors**
  Xiaojuan Wang, Laurence P. Sadwick, The University of Utah

- **Low-Temperature Sintering of Nanoscale Silver Paste: A Lead-free Die-Attach Solution for High-Performance and High-Temperature Electronic Packaging**
  J. G. Bai, Z. Zhang, J. N. Calata, T. Lei, G.-Q. Lu, Virginia Polytechnic Institute and State University

- **Kirchoff’s Law Analysis of GaAs MESFETs and Related Devices at High Temperatures**
  Xiaojuan Wang, Laurence P. Sadwick, The University of Utah

- **Design of a High-Temperature, Small Area Digital Filter on an FPGA**
  Chia-Ming Liu, Chriswell Hutchens, Oklahoma State University; Roger Schultz, Halliburton Energy Services

- **High Temperature SOS Cell Library**
  Usha Badam, Singaravelan Viswanathan, Venkataraman Jeyaraman, Chris Hutchens, Chia-Ming Liu, Oklahoma State University; Roger Schultz, Halliburton Energy Services

- **Development of Silicon Spacer DDP**
  Shin Kim, Dong Gil Shin, Ho Gyu Yoon, Samsung Electronics Co., Ltd.

- **Composite Die-Attach Materials for High-Temperature Packaging Applications**
  Gorinarajan Muralidharan, Terry N. Tiesg, Oak Ridge National Laboratory; R. Wayne Johnson, Auburn University
Wednesday, May 17

REGISTRATION: 7:00 AM – 5:00 PM
CONTINENTAL BREAKFAST: 7:00 AM – 8:00 AM
EXHIBIT HOURS: 10:00 AM – 3:00 PM
REFRESHMENT BREAKS AND LUNCH IN THE EXHIBIT HALL
OPENING REMARKS: 8:00 AM – 8:05 AM
CONFERENCE CHAIRS

**KEYNOTE PRESENTATION: 8:05 AM – 8:45 AM**

**JIP - DEEP TREK UPDATE**

BRUCE OHME, HONEYWELL DEFENSE & SPACE ELECTRONICS SYSTEMS

**WA1 - HT INTEGRATED CIRCUITS I**
Chair: Harold Snyder, Physical Solutions
8:45 am – 10:00 am

- Development of a HT Diagnostics-While-Drilling (DWD) Tool
  Joseph A. Henfling, Randy Normann, David Chavira, Doug Blankenship, Sandia National Laboratories

- A Proposed 68HC11 Chip Set for 275 Degrees C
  Chris Hutchens, Steven Morris, Chia-Ming Liu, Oklahoma State University

- A Quadruple Output 225C 7.3 Watt Isolated Switch Power Supply
  Harold L. Snyder, Jr., Physical Solutions

**WA3 - HT INTEGRATED CIRCUITS II**
Chair: Chris Hutchens, Oklahoma State University
10:25 am – 12:30 pm

- A High-Temperature Silicon Carbide (SiC) Multichip Power Module (MCPM) Inverter for Down-Hole Applications

- An SOI Precision Voltage Reference & Bias Circuitry for Operation to 250C
  Bruce Ohme, Mark R. Larson, Honeywell Defense & Space Electronics Systems

- A Silicon Carbide based 350C Voltage Reference
  Harold L. Snyder, Jr., Physical Solutions

- A Comparison of High Temperature Performance of SiC MOSFETs and JFETs
  Sei-Hyung Ryu, Sumi Krishnaswami, Husna Fatima, Bradley Heath, James Richmond, Anant Agarwal, John Palmour, Cree, Inc.; James Scofield, Air Force Research Laboratory

- Performance Analysis of SOI Based Power Converter for Offline Application at 200°C
  Sunny Liu, Philips Research East Asia; Carsten Deppe, Ulrich Boeke, Georg Saueraender, Philips Research Laboratory

**WA2 - EMERGING TECHNOLOGIES I**
Chair: Don Shiffler, AFRL/DEHP
8:45 am – 10:00 am

- Investigation of Diamond Films at High Power & High Temperatures
  Susan Heidger, Jacob K. Matthews, Howard E. Smith, Air Force Research Laboratory

- High Temperature Operation of Nanodiamond Lateral Vacuum Field Emission Device

- Thermal Properties of Freestanding Diamond Resistors
  P. Hamari, P. Taylor, J. L. Davidson, W. P. Kang, Vanderbilt University

**WA4 - EMERGING TECHNOLOGIES II**
Chair: Jim Scofield, AFRL/PRPE
10:25 am – 12:30 pm

- Internal CVD Diamond Thermal Vias for High Heat Flux Spreading in CTE-Compatible Semiconductor Package Components
  David L. Saums, DS&A LLC; Brian Edward, Pete Ruzicka, Sensis Corporation; Kevin P. Fennessy, CPS Technologies Inc.; Glenn J. Sundberg, University of Massachusetts - Lowell; Jerry Zimmer, sp3 Diamond Technologies Inc.

- Atmospheric Pressure Growth of Bulk GaN for Substrates for High Temperature
  Karen Waldrip, Sandia National Laboratories

- GaN and ZnO Based Electronic & Optoelectronic Devices for Very High Temperatures

- AlGaN/GaN MODFET Device for High Temperature Applications
  Hasina F. Huq, Syed K. Islam, Leon M. Tolbert, University of Tennessee

- High Temperature Simulation of and Comparison with Experimental Data of the Electrically Thermally Enhanced Substrate Leakage in GaAs MEFETs
  Xiaojuan Wang, Laurence P. Sadwick, The University of Utah

LUNCH IN THE EXHIBIT HALL: 12:30 PM – 2:00 PM
### WP1 - HT Integrated Circuits III
Chair: Bruce Ohme, Honeywell Defense & Space Electronics Systems  
3:00 pm – 4:40 pm

**Building Robust 350C Test Fixtures**  
Randy Normann, Don Davis, Paul Vianco, Sandia National Laboratory

**Conduction Heat for Lead-Free Soldering - Simple, Efficient, Economical**  
Sigurd Wathne, Sikama International, Inc.

**Ultra Low-Power 9-bit A/D Converter for Harsh Environments**  
Laurent Demeus, V. Dessard, L. Vancaillie, G. Picun, Cissoid S.A.

**Development of a Non-Volatile Memory Meeting Automotive Temperature & Reliability Requirements and Results**  
Mammen Thomas, Jagdish Pathak, Jim Payne, MEMTEK, LLC; F. Leisenberger, E. Wachmann, A. Wiesner, M. Schrems, Austria Microsystems AG

### WP2 - Packaging II
Chair: R. Wayne Johnson, Auburn University  
3:00 pm – 5:30 pm

**Reusable Packaging for High Temperature (800°C) and High Pressure MEMS**  

**Conduction Heat for Lead-Free Soldering - Simple, Efficient, Economical**  
Sigurd Wathne, Sikama International, Inc.

**Ultra Low-Power 9-bit A/D Converter for Harsh Environments**  
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### Keynote Presentation: 2:00 PM – 2:40 PM
**European HT Activities**  
Colin Johnston, HITEN

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### Keynote Presentation: 8:05 AM – 8:45 AM
**THA1 - Silicon Carbide Discrete Devices I**  
Chair: Bruce Geil, Army Research Laboratory  
8:45 am – 10:00 am

**High Temperature Power Electronics - Application Issues of SiC Devices**  
Leon M. Tolbert, Burak Ozpineci, Oak Ridge National Laboratory; Madhu Chinthavali, 1Oak Ridge Institute for Science and Education; Hui Zhang, The University of Tennessee

**Thermal Aging of TiAlN/Au Ohmic Contacts to P-type SiC**  
Bang-Hung Tsao, Jacob Lawson, University of Dayton Research Institute; James Scofield, Air Force Research Laboratory

**Properties of Unipolar SiC Power Devices for Operation Beyond 200°C Junction Temperature**  
Peter Friedrichs, SICED Electronics Development GmbH & Co., KG

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### Keynote Presentation: 8:05 AM – 8:45 AM
**THA2 - High Temperature Batteries**  
Chair: David Ryan, Air Force Research Laboratory  
8:45 am – 10:00 am

**High Temperature Power Sources for the Drilling Industry**  

**Intrinsically Safe High Temperature Battery for Borehole Applications**  
Za Johnson, Brian Burns, Scott Preston, David Pickett, Mobile Energy Products, Inc.; Ron Guidotti, Sierra Nevada Consulting

**High Temperature Battery for Drilling and Logging Industry**  
Josip Caja, T. Don, J. Dunstan, Electrochemical Systems, Inc.
THP1 - PASSIVES & PACKAGING
Chair: Randy Normann, Sandia National Laboratories
1:40 pm – 2:30 pm

High Temperature Dielectric Properties of Aluminum Nitride
Ender Savrun, Di Wu, Sienna Technologies, Inc.

Temperature Dependent Dielectric Properties of Polycrystalline AlN Substrate with Yttrium Additive
Liang-Yu Chen, OAI/NASA Glenn Research Center

THP2 - CAPACITORS II
Chair: Tom Shrout, The Pennsylvania State University/TRS Technologies Inc.
1:40 pm – 2:30 pm

Passive Components and Interconnect-Pressure Cycling at High Temperature
Rolf Johannessen, Froydis Oldervoll, Truls Fallet, SINTEF Information and Communication Technology; Per Ohlickers, Vestfold University College

Microstructure & Morphology of Carbon Nitride (CNx) Thin Films for use as a High Temperature Dielectric
William Lanter, David C. Ingram, B. Allen Tolson, Charles A. DeJoseph, ISSI

THP3 - EMERGING TECHNOLOGIES III
Chair: Susan Heidger, Air Force Research Laboratory
2:50 pm – 4:30 pm

SSVDs: 500°C Electronics for Extreme Environmental Applications

Active Cooling Technology for Aerospace Controls and High Power Density Electronics
Kenneth Semega, US Air Force Research Laboratory

High Temperature Water Heat Pipes

An Effective Approach to Substantial Cost Savings: The Utilization of Advanced Commercially available Polymers in Military Fiber Optic Applications
Gregory T. Daly, Lockheed Martin Maritime Systems & Sensors
**REGISTRATION FORM**

**REGISTER ON-LINE AT WWW.IMAPS.ORG/HITEC**

**HiTEC 2006 CONFERENCE - MAY 15 - 18, 2006**

☐ Dr.  ☐ Mr.  ☐ Ms.  

First Name___________________________________ M.I._____________ Last Name_______________________________  

Company/Affiliation___________________________________________ Job Position___________________________  

Address___________________________________________________________________________________________  

City___________________________ State______ Zip____________ Country____________________________________  

Phone________________________ Fax_________________________ Email____________________________________

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**REGISTRATION FEES: EARLY REGISTRATION ENDS 4/14/06**

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<tr>
<th>CONFERENCE FEES</th>
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<tr>
<td>$375</td>
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<tr>
<td>$475</td>
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<tr>
<td>Member (IMAPS)</td>
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*Includes one-year individual membership in IMAPS

| Speaker | Chair | $275 | $375 |  
| Student | Chapter Officer | $275 | $375 |  

Conference Fee includes an Extended Abstract Book, all meals listed and a CD-ROM Proceedings.

| Exhibits Only | Free | $10 |  

**TABLETOP EXHIBIT (MAY 16th & 17th)**

| IMAPS Corporate Member | $550 | $650 |  
| Non-IMAPS Corporate Members | $650 | $750 |  
| Yes, we will participate in the CD-ROM* | $50 |  

*see inside front cover for details and deadlines.

**ADDITIONAL PURCHASES**

| Guest/Family Member (meals only) | $160 | $160 |  
| CD-ROM Proceedings (Member Rate) | $200 | $200 |  
| CD-ROM Proceedings (Non-Member Rate) | $300 | $300 |  

| Add to Ship in the US | $7 | $7 |  
| Add to Ship Overseas | $25 | $25 |  

**HOUSING (Hotel Cut-off is April 14, 2006)**

Housing Accommodations must be made directly to: Hilton of Santa Fe  
100 Sandoval Street  
Santa Fe, NM 87501-2131  
Ph: 505-988-2811 or 800-336-3676  
www.santafe.hilton.com  

Single/Double - $159  
Please reference IMAPS when making reservation.

To reserve room on-line, go to www.santafe.hilton.com  
Enter your arrival & departure dates, click Go.  
Enter “IMA” in the field for Group/Convention Code and continue through making your reservation.