

Program

Thermal Challenges In Next Generation Electronic Systems II (THERMES 2007)

January 7 - 10, 2007

The Hotel Santa Fe
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NOTES

- **Please observe “No Smoking” at ECI technical sessions, meals and social hours.**
- **Speakers should allow time at the end of their presentation for questions and discussion.**
- **Please silence your cell phone during technical sessions.**
- **All cameras, camera phones, audio, video and other recording devices are prohibited from technical sessions and poster sessions.**
- **Meals will be in the Hacienda Room.**
- **Technical Sessions will be in the Kiva Ballroom.**
- **Santa Fe is at an altitude of 6989 feet and has a high desert climate. We suggest that you stay properly hydrated (drink lots of water), limit your alcohol consumption, and avoid over-exertion.**

Sunday, January 7, 2007

1:00 - 3:00 Registration

2:30 - 3:00 Coffee

3:00 - 3:10 Opening Remarks – Suresh Garimella and Amy Fleischer
Conference Welcome – Frank Schmidt

3:10 - 4:50 **Technical Session 1: Transport in Micro and Nano-thermal Systems 1**
Session Chair: Jayathi Murthy

Invited - Fundamental Limits of Heat Transfer
A Avila, RK Cavin, VV Zhirnov, & HH Hosack

One Dimensional Thin Film Phonon Transport with Generation
A Bulusu & DG Walker

Transient Thermal Diffusion Analysis on 65nm MOSFET
K Yazawa, T Kawamura, F Sugaya and H Kuroda & S Furkay

A Comparison of Thin Film Microrefrigerators Based on Si/SiGe,
Superlattices and Bulk SiGe
Y Ezzahri, G Zeng, K Fukutani, Z Bian & A Shakouri

Performance Potential and Challenges of Future Refrigeration-Based
Electronics Cooling Approaches
L Cremaschi, EA Groll & SV Garimella

4:50 - 5:00 Break

5:00 - 6:40 **Technical Session 2: Transport in Micro and Nano-thermal Systems 2**
Session Chair: M. Spector

A CCD Thermoreflectance Thermography System and Its Calibration
PL Komarov, MG Burzo & PE Raad

Thermal Characterization of Embedded Electronic Features by an Integrated
System of CCD Thermography and Self-Adaptive Numerical Modeling
PE Raad, PL Komarov & MG Burzo

Transient Thermal Performance of Phase Change Materials with Embedded
Graphite Nanofibers
T Kopec, AS Fleischer, RD Weinstein & CA Bessel

Energy Minimization Based Analysis of Electrowetting For Microelectronics
Cooling Applications
V Bahadur & SV Garimella

Strategies for Effective Use of Exergy Based Modeling of Data Center
Thermal Management Systems
S McAllister, V Carey, A Shah, C Bash & C Patel

7:00 - 8:30 Dinner followed by Social Hour (8:30 – 9:30)

Monday, January 8, 2007

7:00 - 8:00 Breakfast

8:00 - 8:45 **Keynote 1**
R Yavatkar, Intel Fellow
Session Chair: Ravi Mahajan

8:45 - 10:00 **Panel 1: Electrothermal and Multiphysics Co-Design of Electronics Systems**
Moderators: J Murthy, A Keshavarzi
Panelists: E Pop, M Stan, U Ghoshal

10:00 -10:15 Coffee Break

10:15 -11:55 **Technical Session 3: Issues in Microchannel Transport**
Session Chair: Bruce Myers

Critical Heat Flux of R-123 in Rectangular Microchannels
A Kosar & Y Peles

High Performance, Low-Cost, Liquid Micro-Channel Cooler
RL Webb

Electronic Cooling with Sub- and Super-Critical CO₂ in Microchannels
JC Davis

Force-Fed Evaporation and Condensation Utilizing Advanced-Micro-Structured Surfaces and Micro-Channels
T Baummer, E Cetegen, S Dessiatoun & M Ohadi

Numerical Study of Laminar Heat Transfer and Pressure Drop Characteristics in a Water-cooled Minichannel Heat Sink
XL Xie, YL He & WQ Tao

12:00 -1:15 Lunch

1:15 - 2:30 **Panel 2: New/nano Structured Materials for Thermal Management**
Moderator: R Prasher
Panelists: S Graham, J Murthy, L Shi

2:30 - 3:30 Break

3:30 - 5:10 **Technical Session 4: Advances in Liquid Cooling**
Session Chair: C. Patel

Heat Exchanger Design Methodology for Electronic Heat Sinks
RL Webb

Flow Boiling of FC-72 from a Screen-Laminate Extended Surface Matrix
B Holland, N Ozman & RA Wirtz

Microscale Analysis of Heat Transfer in Nucleate Boiling of FC-72 Liquid
S Moghaddam & KT Kiger

Monday, January 8, 2007 (continued)

Spraycool™ Compact Server for Military Shipboard Environments
A Johnston, D Stone, T Cader & D Locklear

Convection Heat Transfer in Electrostatic Actuated Liquid Droplets for
Electronics Cooling
H Oprins, J Danneel, B Van Ha, B Vandeveldel & M Baelmans

5:10 - 6:25

Panel 3: Progress and Needs in High Heat Flux Thermal Management

Moderators: C Patel & S Bhavnanni

Panelists: K Yazawa, R Mahajan, S Kandlikar

6:25 - 7:40

Panel 4: Novel Cooling Strategies/Hot Spot Thermal Management

Moderators: R. Venkatasubramaniam, R. Mahajan

Panelists: D Polla, V Zhirnov, M. Tirumala

7:40

Dinner on your own

Tuesday, January 9, 2007

7:00 - 8:00 Breakfast

8:00 - 8:45 **Keynote 2**
S Kubota, Senior VP Sony Corp
Session Chair: Masaru Ishizuka

8:45 - 10:00 **Panel 5: Research Challenges for the Thermal Design of Next Generation Data Centers**
Moderators: Y Joshi, R Schmidt
Panelists: M Patterson, B Sammakia,

10:00 - 10:15 Coffee Break

10:15 - 11:55 **Technical Session 5: Thermal Challenges and Solutions in Small Form Factor Electronics**
Session Chair: K. Yazawa

Invited - Thermal Performance of ALOX High Brightness Light Emitting Diode (LED) Package
S Gao, J Hong, S Choi & S Yi

Mobile Thermal Challenges in Future Platforms
RK Mongia, H Pokharna & S. Machiroutu

Laminar Wall Jets for Skin Cooling in Low Form Factor Electronics
A Bhattacharya, RK Mongia & R Kamiya

Numerical Investigation on Thermal Management of a Processor Board
B Gao & XF Peng

Study on the Effect of Inclination on Thermal Behaviors of Natural Convection Inside Thin Electronic Equipment Casings
M Ishizuka, S Nakagawa & Y Kitamura

11:55 - 1:15 Lunch

1:15 - 2:30 **Panel 6: Needs in Military, Automotive and Harsh Environments**
Moderators: B Myers & L Chorosinski
Panelists: R Wilcoxon & M Mojarradi

2:30 - 3:30 Break

3:30 - 5:50 **Technical Session 6: Heat Pipe Innovations**
Session Chair: R. Scott Downing

Invited - Cooling Technology Using Heat Pipes and Vapor Chamber.
M Mochizuki, Y Saito, F Kiyooka, TT Nguyen, TV Nguyen & V Wuttijumnong

Development of a MEMS Micro Loop Heat Pipe for Electronics Cooling
A Shuja, S Parimi, P Medis, FM Gerner & HT Henderson

Tuesday, January 9, 2007 (continued)

Vaporization Heat Transfer in Sintered Copper Wicks with Microgrooves in Heat Pipe Evaporators
Y Zhao & C Chen

Multi-Evaporator Hybrid Loop Heat Pipe for Cooling High Performance Servers
W Zimbeck, J Yun, J Cennamo & E Krolczek

An Experimental Study of a Novel High Flux Heat Pipe for Chip Cooling of Desktop Computer
XL Xie, YL He, WQ Tao & HW Yang

Experimental Study on Indirect Thermosyphon Radiator Coupled With Flat Heat Pipe for Electronic Components
X Zhang & GY Ma

An Experimental Investigation on the Thermal Performance of a Flat Plate Heat Pipe Spreader
M Zhang, ZL Liu & GY Ma

5:50 - 7:05

Panel 7: Progression and Challenges in Software Tools

Moderators: M Baelmans

Panelists: P Sathyamurthy, A Docca, E Cheng & S Mazumdar

7:30 - 9:30

Banquet

Wednesday, January 10, 2007

7:00 - 8:00 Breakfast

8:00 - 10:20 **Technical Session 7: Advances in System Modeling**

Session Chair: Y. Joshi

Invited - Thermal Challenges for SPARC Based Microprocessors
B Sen & J Jones

Improved Compact Thermal Model for Studying 3-D Interconnect Structures with Low k Dielectrics

A Whelan, Y Joshi & W King

Interconnection of Subsystem Reduced Order Models in the Electro-Thermal Analysis of Large Systems

P Mathai & B Shapiro

A Technical Review of Studies on Temperature Distribution in Three Dimensional Stacked Packages

A Desai, J Geer & B Sammakia

Scaling Relations for Induction Heating

KW French

Data Center TCO: A Comparison of High Density and Low Density Spaces

MK Patterson, DG Costello, PF Grimm & M Loeffler

Passive or Active Cooling: A Model for Fast Thermal Exploration of Electronic Product Concepts

R Strijk, JAG de Deugd & JSM Vergeest

10:20 - 10:50 Coffee Break

10:50 - 12:05 **Panel 8: Advances in Measurement and Characterization**

Moderators: P Raad

Panelists: A Shakouri, H Hosack

12:05 - 1:15 Lunch

1:15 - 2:15 **Technical Session 8: Innovative Air Cooling Techniques**

Session Chair: B. Sammakia

Mixed Convection Heat Transfer and Pressure Drop of Entrance Region in an Inclined Rectangular Duct

C Daotong, L Jiping, Y Shenhua & H Junjie

Optimization of Compact Heat Exchanger with Genetic Algorithm Considering Minimum Entropy Generation

L Zhang & C Yang

Multi-Disciplinary Design Optimization of the Plate Fin Heat Sink

C Yang & J Zhou

2:15 - 2:20 Closing Remarks – Amy Fleischer, Suresh Garimella