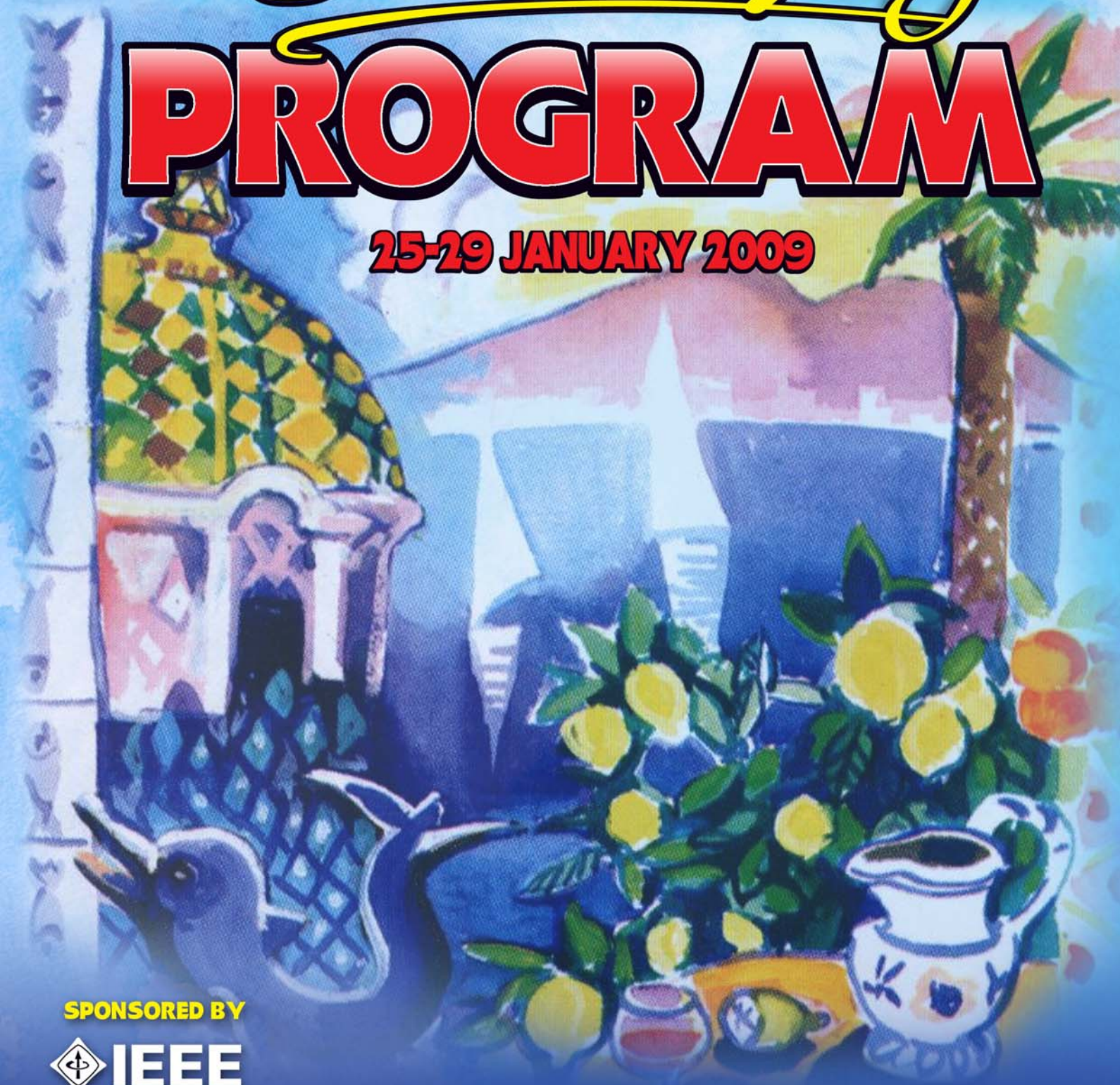
22nd IEEE International Conference on Micro Electro Mechanical Systems

MEMS 2009

Sorrento, Italy

PROGRAM

25-29 JANUARY 2009



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Program AT A GLANCE

	SUNDAY 25 JANUARY	MONDAY 26 JANUARY	TUESDAY 27 JANUARY	WEDNESDAY 28 JANUARY	THURSDAY 29 JANUARY
08:00		**Registration** 07:30 - 18:00			
08:30			**Registration** 08:30 - 18:20	**Registration** 08:30 - 18:40	**Registration** 08:30 - 13:10
09:00		**Welcome Address** 09:00 - 09:20	**Invited Speaker II** *Luke P. Lee, USA* 09:00 - 09:40	**Invited Speaker III** *Seiji Samukawa, JAPAN* 09:00 - 09:40	**Poster / Oral Session IV** 09:00 - 11:00
09:30		**Invited Speaker I** *Benedetto Vigna, ITALY* 09:20 - 10:00	**Session V** Cells and Particles 09:40 - 11:00	**Session VIII** Nanoprocessing & NEMS 09:40 - 11:00	
10:00		**Session I** MEMS Actuators 10:00 - 10:40			
10:30					
11:00		**Exhibit Inspection & Break** 10:40 - 11:10	**Exhibit Inspection & Break** 11:00 - 11:30	**Exhibit Inspection & Break** 11:00 - 11:30	**Session XI** BioMEMS 11:00 - 13:00
11:30		**Session II** RF MEMS 11:10 - 12:30	**Session VI** Micro Processing and Characterization 11:30 - 13:10	**Session IX** Fabrication & Packaging 11:30 - 13:10	
12:00					
12:30		**Session III** Fuel Cell Power MEMS 12:30 - 13:10			
13:00					**Conference Adjourns** 13:00
13:30		**Exhibit Inspection & Lunch** 13:10 - 14:30	**MEMS 2010 ANNOUNCEMENT** 13:10 - 13:20	**Exhibit Inspection & Lunch** 13:10 - 14:30	
14:00			**Exhibit Inspection & Lunch** 13:20 - 14:30		
14:30		**Poster / Oral Session I** 14:30 - 16:30	**Poster / Oral Session II** 14:30 - 16:30	**Poster / Oral Session III** 14:30 - 16:30	
15:00					
15:30					
16:00					
16:30		**Session IV** MEMS in µFluidics 16:30 - 17:50	**Session VII** Physical MEMS 16:30 - 18:10	**Session X** Optical MEMS 16:30 - 18:30	
17:00					
17:30					
18:00	**Registration** 18:00 - 21:00	**Adjourn for the day** 17:50	**Adjourn for the day** 18:10		
18:30	**Welcome Reception** 18:30 - 20:30			**Adjourn for the day** 18:30	
19:30				**Conference Banquet** 19:30 - 23:00	

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22nd IEEE International Conference on Micro Electro Mechanical Systems

MEMS 2009 Sorrento, Italy

LETTER FROM THE CO-CHAIRS

We welcome you to the 22nd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2009) in Sorrento, Italy!

The IEEE MEMS Conference series started in 1987 and is known as the IEEE International Conference on Micro Electro Mechanical Systems since 1999. Over the last two decades, the MEMS community has experienced significant growth in various areas of device science and technology. New activities have evolved into major research fields such as Bio-MEMS, Optical MEMS, RF MEMS, Power MEMS, NEMS and many more interesting fields. The enthusiasm of this community is evident from the creativity and the relentless expanding range of MEMS applications.

It is our great pleasure to announce that this year we received a record breaking number of 856 abstracts! A total of 276 papers were carefully selected by the 24 experts of the Technical Program Committee (TPC). The presentations are arranged in a single-session format that includes three invited keynote presentations, 47 oral presentations and 229 posters. The poster sessions have always been a highlight of this Conference and follow the successful poster/oral presentation format pioneered in 2004. Poster presentations are divided into four sessions to facilitate interaction with the authors, who will have their posters on display throughout the Conference. All Conference papers, oral and poster, are included in the Technical Digest, which is distributed on a USB flash drive to all Conference attendees. For the first time in the MEMS Conference history, printed books are available on request only.

We would like to express our sincere gratitude to all the authors of the submitted abstracts. Their high quality work serves as the foundation for the success of this Conference. The papers were selected by the TPC made up with equal representation from three regional divisions: America, Europe & Africa, and Asia & Oceania. Four sub-committees were formed in order to facilitate a careful review of the large number of submitted abstracts. Each abstract has been evaluated and rated by six expert members of the TPC. The committee's recommendations on the acceptance or rejection of papers were taken as binding. We are grateful to all TPC members who volunteered their valuable time, including participation in a two-day on-site meeting in Zürich, Switzerland, for paper selection. We are also indebted to the International Steering Committee and the Advisory Co-Chairs, Oliver Brand and Yitshak Zohar, for generously sharing their experience. We gratefully acknowledge the industrial support groups, exhibitors and benefactors for their involvement in this Conference, and are very thankful to the IEEE Robotics and Automation Society for their continued support of this meeting. The dedicated effort of Ms. Katharine Cline and her team at PMMI in managing this Conference is greatly appreciated.

In closing, we hope you enjoy the Conference presentations, posters, exhibition booths and events this week in Sorrento!

Lina Sarro and Christofer Hierold
MEMS 2009 Co-Chairs

GENERAL INFORMATION

CONFERENCE LOCATION
All sessions will be held at the **Hilton Sorrento Palace,** via S. Antonio, no. 13, Sorrento, ITALY, 80067, phone: +39-081-878-4141, fax: +39-081-878-3933

DIALING CODES
Italy's International Country Code: +39. Sorrento's Local Area Code: 081

REGISTRATION & INFORMATION DESK
The Registration and Information desk will be open during the following times:

Sunday, 25 January	18:00 - 21:00
Monday, 26 January	07:30 - 18:00
Tuesday, 27 January	08:30 - 18:20
Wednesday, 28 January	08:30 - 18:40
Thursday, 29 January	08:30 - 13:10

MEETING ROOM LOCATIONS
General Session: . . . . . Auditorium Sirene
Poster Sessions: . . . . . Nettuno, Foyer Congress Centre, and Foyer Sirene
Exhibitor Hall:. . . . . Nettuno, Foyer Congress Centre, and Foyer Sirene
Lunch: . . . . . Sant'Antonio

LUNCHES
To reduce long lines for the buffet, we recommend that you feel free to visit the posters and exhibits before standing in line for lunch. There will be plenty of food for lunch no matter when you go through the buffet line.

NAME BADGES
All attendees must wear their name badge at all times to gain admission to all sessions, exhibits, lunches and receptions.

CHIMES
The chimes will ring five minutes before the end of each scheduled break. The sessions will begin on time, so please return to the sessions when you hear the chimes.

MESSAGE & JOB MARKET BOARD
Please visit the Message and Job Market Board located near the Conference Registration Desk.

WIRELESS INTERNET SERVICE
Wireless Internet is available to purchase from Swisscom for use within the Hilton Sorrento Palace. The charges are 24 consecutive hours - €22; 7 consecutive days - €88. One access code will provide you with wireless Internet in your sleeping room as well as in the meeting space.

TECHNICAL DIGEST USB FLASH DRIVE
One copy of the Technical Digest on a USB flash drive is included in your bag. Additional copies may be purchased at the Registration Desk. Purchase price of the Technical Digest will increase after the Conference. Be sure to order your additional copies during the Conference. Please note that there are a limited number of hard copy books to purchase.

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Hard Copy Book & USB Flash Drive - IEEE Member . . . . . €160 each
Hard Copy Book & USB Flash Drive - Non-Member . . . . . €210 each

CELL PHONES, PAGERS & WATCH ALARMS
Out of courtesy to our speakers and other attendees, please turn off any cellular phones, pagers and watch alarms during sessions.

CAMERAS & VIDEO RECORDERS
Cameras and video tape recorders are strictly prohibited in the sessions, poster presentations and the exhibit area.

SMOKING
All meeting rooms and seated functions are smoke free. Please adhere to the smoking policy of the Hilton Sorrento Palace.

TIPPING STANDARDS
Although service or "servizio" is included in the check or bill, a small tip (in cash), is always appreciated. 5% is sufficient, 10% is considered a large tip.

SHIPPING SERVICE
Shipping Service is available by visiting the hotel Business Center located near the Hotel Registration Desk. The Business Center hours are Mon.-Thurs. 08:00 to 22:00.

SOCIAL EVENTS

Wine and Cheese Welcome Reception
Sunday, 25 January
18:30 - 20:30

The Welcome Reception will be held in the Sorrento Lounge of the Hilton Sorrento Palace. Name badges are required.

Conference Banquet - Sponsored by STMicroelectronics
Wednesday, 28 January
19:30 - 23:00

No Conference is complete without a banquet. Join us for a festive Italian evening on Wednesday, 28 January, 19:30 - 23:00 in the Sant'Antonio Room at the Hilton Sorrento Palace.

Your registration includes one (1) ticket. Additional guest tickets may be purchased for €85 each at the on-site Conference Registration Desk.

ORGANIZING COMMITTEE

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EXHIBIT HOURS:

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Tokyo Electron Limited (TEL) has announced Wafer-Level MEMS Tester TEMEON™-C for Capacitive MEMS devices. TEMEON™-C uses TEL patented technologies to eliminate the parasitic capacitance in order to measure fF (femto Farad) levels of static capacitance accurately and stably at the wafer level within any test environment. In addition to static capacitance measurements, TEMEON™-C also directly measures dynamic capacitance and the displacements of MEMS structures, returning Resonant Frequency and Q-values with pass/fail results.

EXHIBITORS continued

EXHIBITOR **BOOTH**

Tousimis **16**
2211 Lewis Avenue
Rockville, MD 20851 USA
phone: 1-301-881-2450
fax: 1-301-881-5374
www.tousimis.com

Tousimis designs and manufacturers Supercritical Point Dryers using the CO2 critical point drying process enabling delicate micro 3-D structure preservation. Leading applications include MEMS, Gel, Carbon Nano-Tubes, Biological, Polymer-Matrix and most recently: Graphene Drying. Tousimis has a global distribution sales and service support team catering to your facility's CPD needs. Visit us in Booth #7 and at www.tousimis.com.

Tyndall National Institute **20**
Lee Maltings, Prospect Row
Cork, IRELAND
phone: +35-3-87-833-3390
fax: +35-3-21-490-4058
www.tyndall.ie

Tyndall National Institute is one of Europe's leading research centres, specialising in ICT hardware. It was established in 2004, bringing together researchers from the NMRC, UCC and CIT. Tyndall has a critical mass of over 350 researchers, engineers, students and support staff placing a particular emphasis on quality, accomplishment and the delivery to Ireland of value from research. Tyndalls areas of expertise range from micro-nanoelectronics, mems, and photonics to theory modeling supported by a central fabrication facility.

XACTIX, Inc. **3**
2403 Sidney Street, Suite 300
Pittsburgh, PA 15203 USA
phone: 1-412-381-3195
fax: 1-412-381-1136
www.xactix.com

XACTIX is the manufacturer of the Xetch® xenon difluoride (XeF2) etching systems with many different models to support small labs through high volume production. These dry isotropic etching tools are used to etch silicon, molybdenum and germanium and are popular in the MEMS community due to high selectivity versus many standard films including photoresist, silicon dioxide, silicon nitride, and aluminum. The Xetch® systems are particularly well suited for release, but are certainly not limited to MEMS applications and are useful for many applications where highly selective isotropic silicon, molybdenum and germanium etching is required. XACTIX also provides XeF2 etching services.

Yole Développement **34**
45 Rue Sainte Geneviève
Lyon, 69006 FRANCE
phone: +33-472-83-01-80
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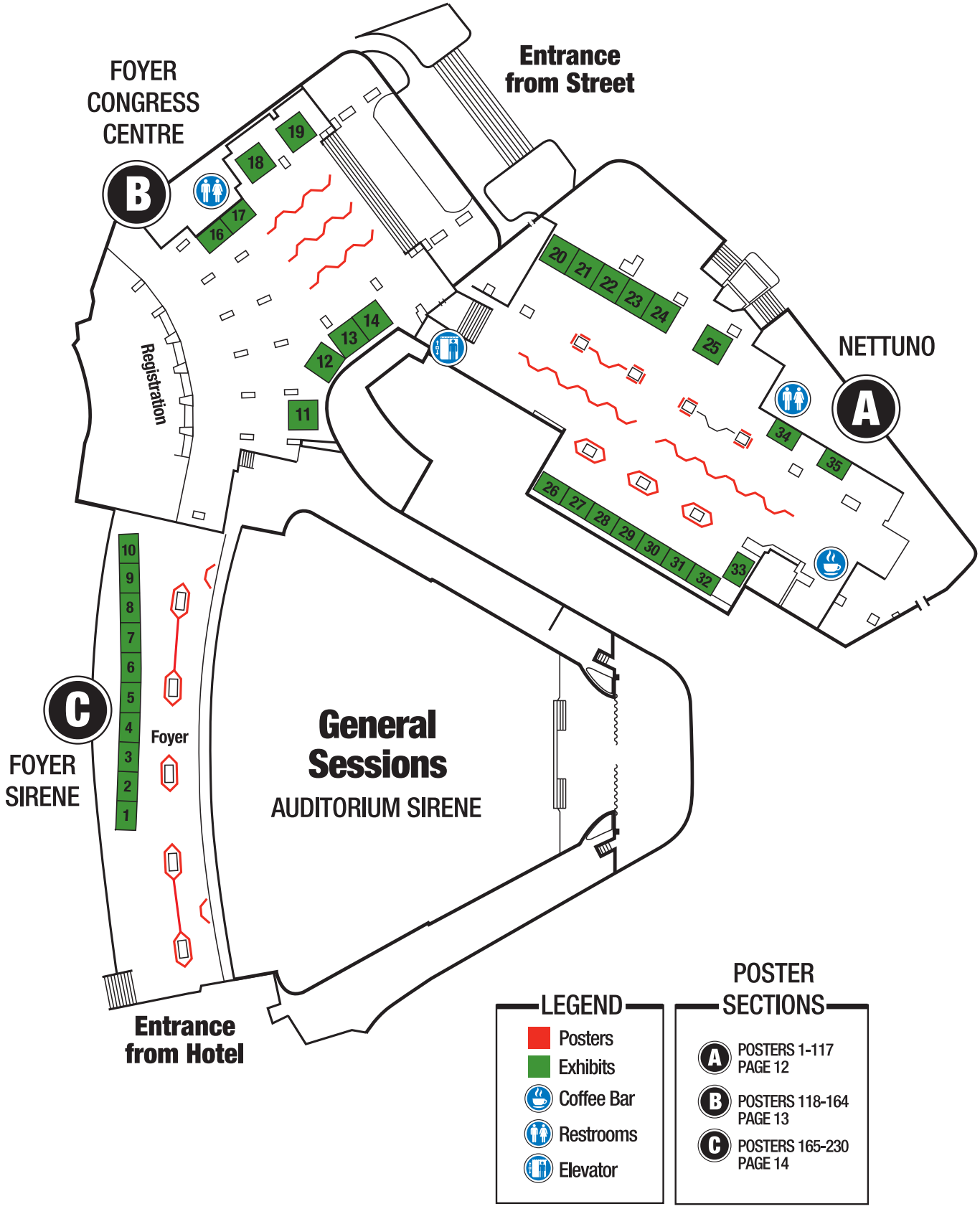
Yole Developpement is the world leader in the analysis of disruptive semiconductor applications and markets. Our products and services: Micronews, Yole Developpement monthly magazine, with more than 23,000 worldwide subscribers *(http://www.yole.fr/pagesAn/Micronews/newslett.asp, http://www.yole.fr/pagesAn/Micronews/newslett.asp)*; I Micronews the website *(http://www.i-micronews.com, www.i-micronews.com)* has about 4000 visitors per week. Our last reports in MEMS theme: IMU Markets 2007-2012: Competitive market analysis of the market. *(http://www.yole.fr/pagesAn/products/imu.asp; http://www.yole.fr/pagesAn/products/imu.asp)*; MIS 2008 - Status of the MEMS Industry *(http://www.yole.fr/pagesAn/products/mis.asp, http://www.yole.fr/pagesAn/products/mis.asp)*; Status of the MEMS industry: Analysis of the structure, the possible evolution, the emerging applications of the MEMS market (http://www.yole.fr/pagesAn/products/mis.asp, http://www.yole.fr/pagesAn/products/mis.asp); MEMS for Cell Phones: Evaluation of the business potential and reality of MEMS applications in mobile phones. *(http://www.yole.fr/pagesAn/products/mems4mobile.asp, http://www.yole.fr/pagesAn/products/mems4mobile.asp)*.

POSTER & EXHIBIT FLOORPLAN



POSTER FLOORPLAN - SECTION A

POSTER SECTION A

NETTUNO

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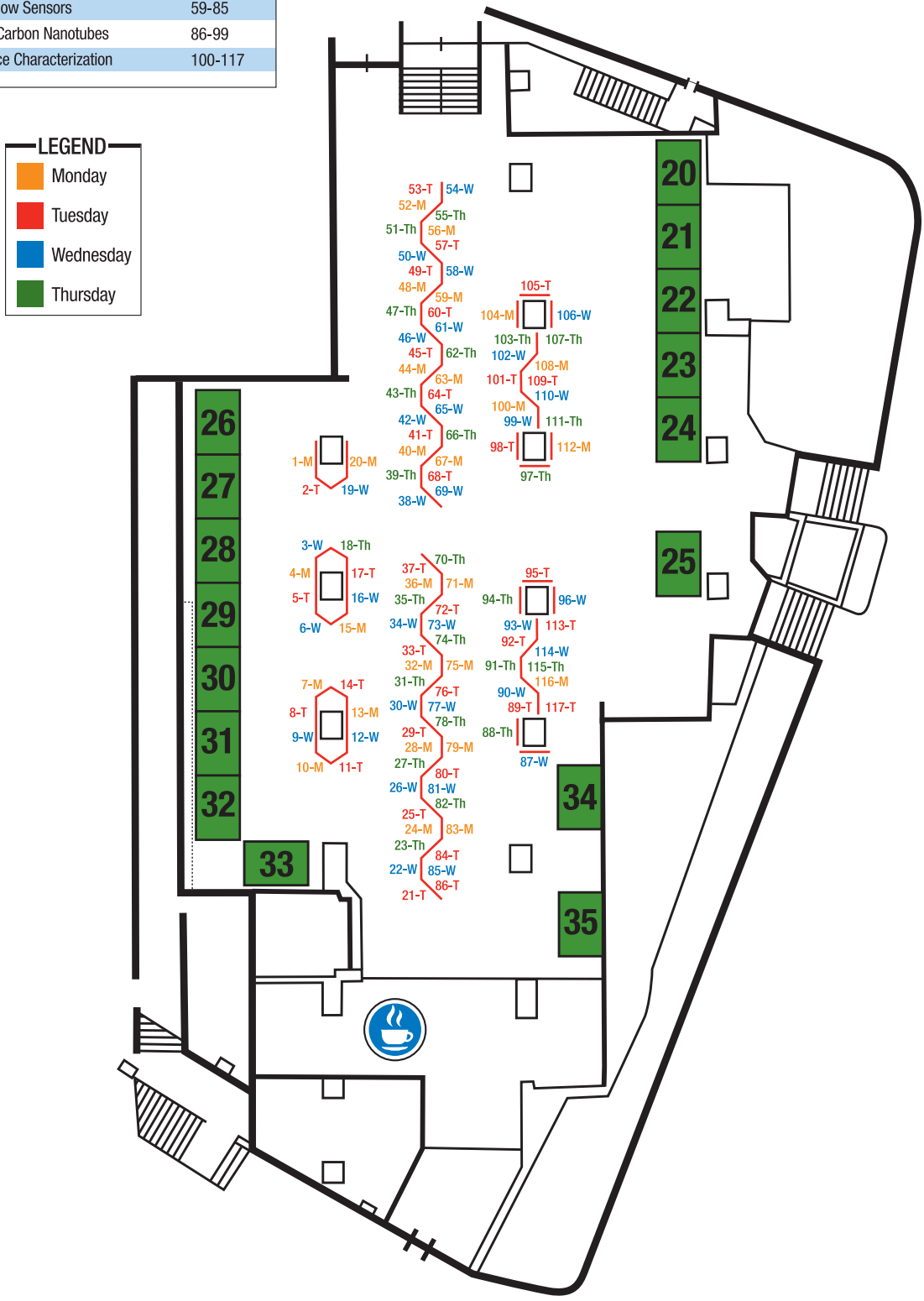

POSTER FLOORPLAN - SECTION B

POSTER SECTION B
FOYER CONGRESS CENTRE

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LEGEND
- Monday
- Tuesday
- Wednesday
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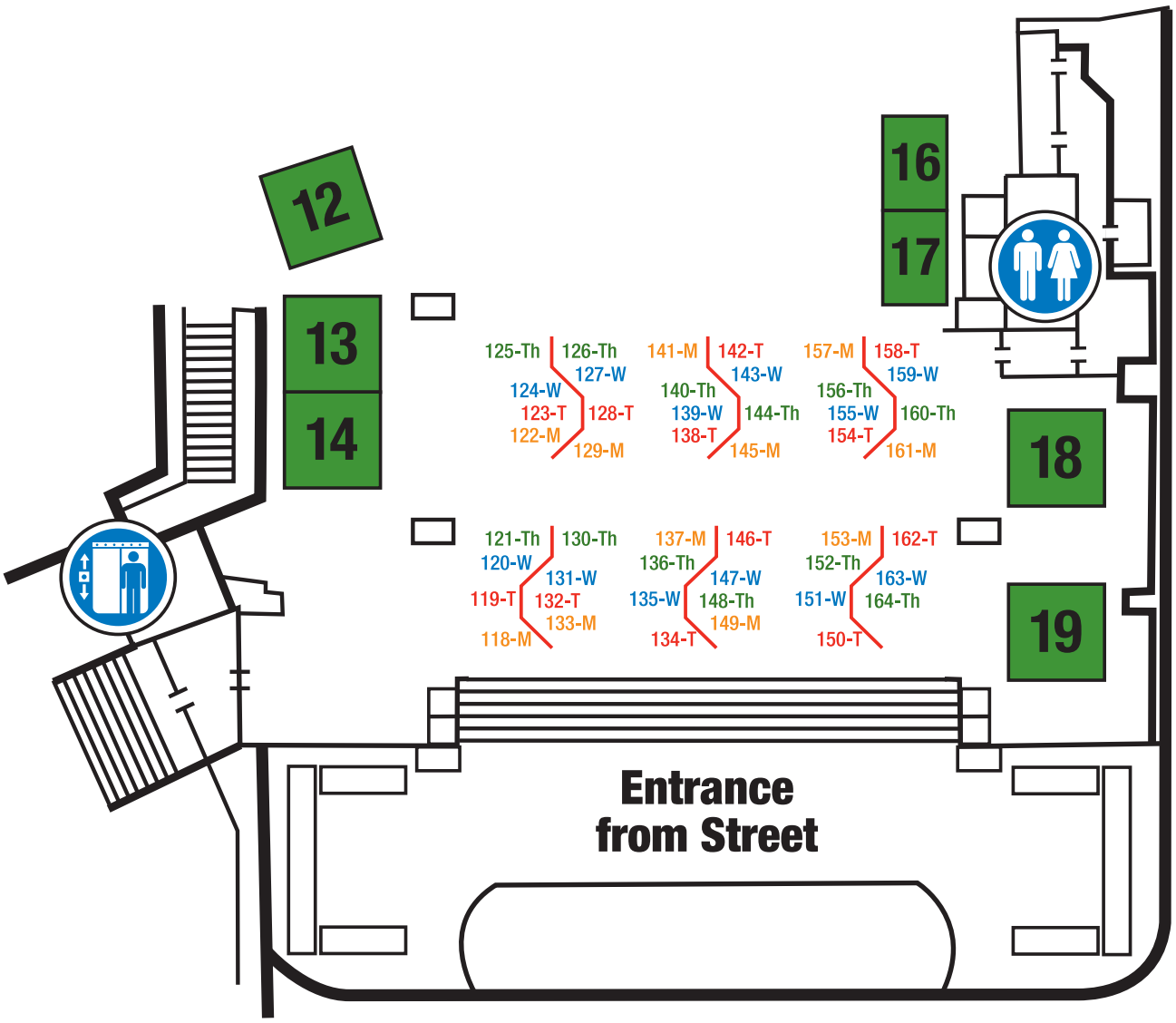
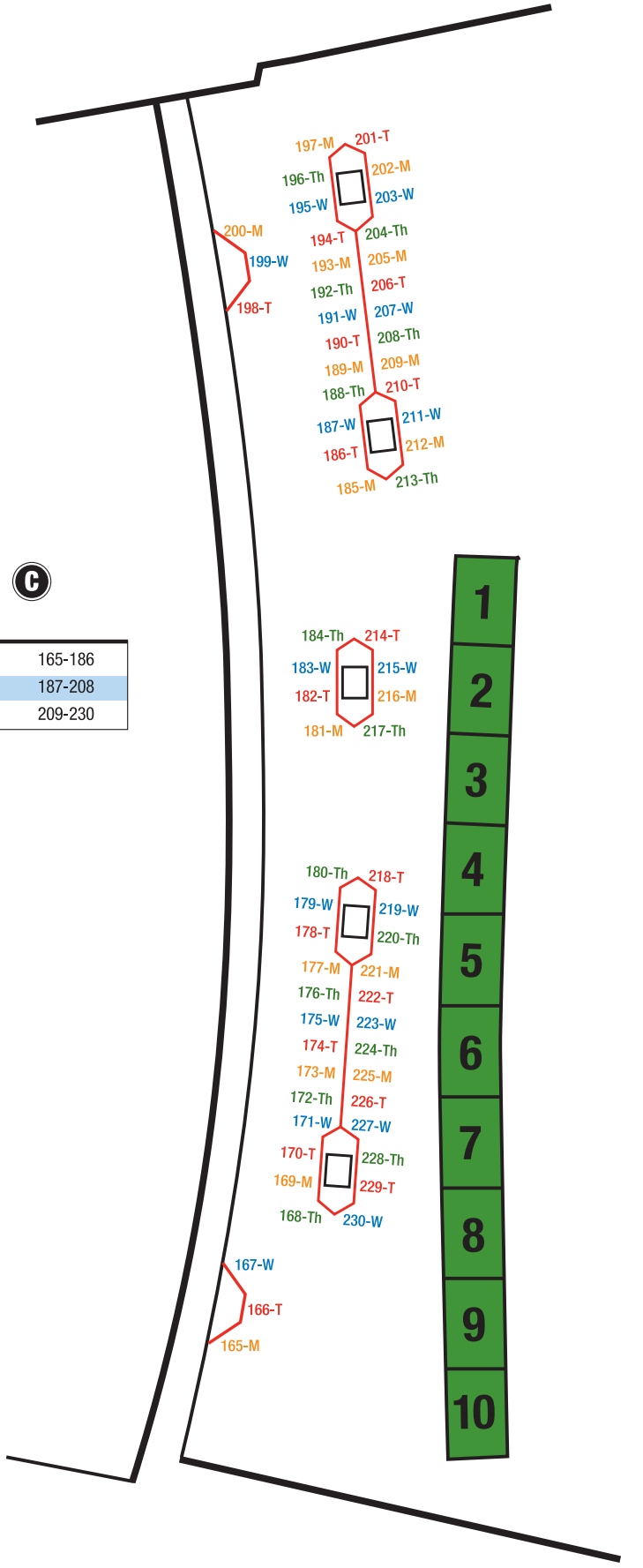


POSTER FLOORPLAN - SECTION C



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LEGEND

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- Tuesday
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TECHNICAL PROGRAM INFORMATION

The Technical Program consists of three invited speaker presentations, a general session of contributed papers and 4 poster/oral sessions.

Oral Sessions

All oral sessions will be held in the Auditorium Sirene.

Poster/Oral Sessions

The poster/oral format will consist of three (3) scheduled 10 minute, oral presentations which will be presented in each session on their assigned day in front of each poster. The chimes will ring five minutes before the start of each presentation. Posters will be on display from Monday at 07:30 through Thursday at 11:00 in the Nettuno, Foyer Congress Centre, and the Foyer Sirene. All poster papers are listed in this program by topic category with their assigned number starting on page 23. Authors will be available for questions throughout the entire assigned session.

SESSION I	SESSION III
Monday, 26 January	**Wednesday, 28 January**
14:30 – 16:30	14:30 – 16:30
Poster/Oral Presentation 1 – 15:00	Poster/Oral Presentation 1 – 15:00
Poster/Oral Presentation 2 – 15:30	Poster/Oral Presentation 2 – 15:30
Poster/Oral Presentation 3 – 16:00	Poster/Oral Presentation 3 – 16:00
SESSION II	**SESSION IV**
Tuesday, 27 January	**Thursday, 29 January**
14:30 – 16:30	09:00 – 11:00
Poster/Oral Presentation 1 – 15:00	Poster/Oral Presentation 1 – 09:30
Poster/Oral Presentation 2 – 15:30	Poster/Oral Presentation 2 – 10:00
Poster/Oral Presentation 3 – 16:00	Poster/Oral Presentation 3 – 10:30

Guide to Understanding Poster Numbering

Each poster is assigned a unique number which clearly indicates when and where the poster is presented. The number of each poster is shown on the left-hand side before the title.

A typical poster number is shown here is 132-Th

The number (i.e. 132) is the assigned poster board position on the floorplan. See floorplans starting on page 11.

The next character (i.e. Th) indicates the day of the Conference: M = Monday, T = Tuesday, W = Wednesday, Th = Thursday

Page Numbering

To assist you with finding the paper in the Technical Digest, we have provided the page number following each paper title in blue.

Sunday, 25 January 2009

18:00 - 21:00 **REGISTRATION**

18:30 - 20:30 **WELCOME RECEPTION**

Monday, 26 January 2009

09:00 **WELCOME ADDRESS**
Christofer Hierold, *ETH Zürich, SWITZERLAND*
Pasqualina M. Sarro, *Delft University of Technology, THE NETHERLANDS*

09:20 **INVITED SPEAKER I**
MEMS EPIPHANY 1
Benedetto Vigna
ST Microelectronics s.r.l., ITALY

SESSION I MEMS ACTUATORS
Session Chairs:
D. Elata, Technion, *Israel Institute of Technology, ISRAEL*
Q. Lin, *Columbia University, USA*

10:00 **DEVELOPMENT OF CALIBRATION STANDARDS FOR THE OPTICAL MEASUREMENT OF IN-PLANE DISPLACEMENTS OF MICROMECHANICAL COMPONENTS** 7
J. Gaspar[1], J. Held[1], G. Pedrini[2], W. Osten[2], and O. Paul[1]
[1]University of Freiburg - IMTEK, GERMANY and [2]University of Stuttgart, GERMANY

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K. Kobayashi and K. Ikuta
Nagoya University, JAPAN

10:40 **EXHIBIT INSPECTION AND BREAK**

SESSION II RF MEMS
Session Chairs:
S. Bhave, *Cornell University, USA*
J.-B. Yoon, *Korea Advanced Institute of Science and Technology (KAIST), KOREA*

11:10 **NOVEL CONCEPT OF MICROWAVE MEMS RECONFIGURABLE 7X45° MULTI-STAGE DIELECTRIC-BLOCK PHASE SHIFTER** 15
N. Somjit, G. Stemme, and J. Oberhammer
Royal Institute of Technology (KTH), SWEDEN

11:30 **MICROMECHANICAL RESONANT DISPLACEMENT GAIN STAGES** 19
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University of California, Berkeley, USA

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K.-L. Chen[1], H. Chandrahalim[2], A.B. Graham[1], S.A. Bhave[2], R.T. Howe[1], and T.W. Kenny[1]
[1]Stanford University, USA and [2]Cornell University, USA

12:10 **A NOVEL STRESS-GRADIENT-ROBUST METAL-CONTACT SWITCH** 27
H. Sedaghat-Pisheh[1], J.-M. Kim[2], and G.M. Rebeiz[1]
[1]University of California, San Diego, USA and [2]Chonbuk National University, KOREA

SESSION III FUEL CELL POWER MEMS
Session Chairs:
X. Wang, *Tsinghua University, CHINA*
E. Yeatman, *Imperial College, UK*

12:30 **MICROBIAL FUEL CELL BASED ON ELECTRODE-EXOELECTROGENIC BACTERIA INTERFACE** 31
E. Parra and L. Lin
University of California, Berkeley, USA

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V.V. Swaminathan, L. Zhu, B. Gurau, R.I. Masel, and M.A. Shannon
University of Illinois, Urbana-Champaign, USA

13:10 **EXHIBIT INSPECTION AND LUNCH**

14:30 - 16:30 **POSTER/ORAL SESSION I**
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G. Stemme, *Royal Institute of Technology (KTH), SWEDEN*
R. Zengerle, *University of Freiburg - IMTEK, GERMANY*

SESSION IV MEMS IN MICROFLUIDICS

Session Chairs:
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Y. Zohar, *University of Arizona, USA*

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Royal Institute of Technology (KTH), SWEDEN

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[1]Institute for Micromachining and Information Technology (HSG-IMIT), GERMANY and
[2]*University of Freiburg - IMTEK, GERMANY*

17:10 **CONTINUOUS MICRO-PARTICLE SEPARATION USING OPTICALLY-INDUCED DIELECTROPHORETIC FORCES** 47
W.-Y. Lin[1], Y.-H. Lin[1], and G.-B. Lee[1,2]
[1]*National Cheng Kung University, TAIWAN and* [2]*Industrial Technology Research Institute, TAIWAN*

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Tohoku University, JAPAN

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University of California, Berkeley, USA

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Y. Morimoto[1], Y. Tsuda[1,2], and S. Takeuchi[1,2,3]
[1]University of Tokyo, JAPAN, [2]Ministry of Economy, Trade and Industry (METI), JAPAN, and [3]Japan Science and Technology Agency (JST)

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University of Tokyo, JAPAN

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W.C. Lee[1,3], F.A. Kuypers[1], Y.-H. Cho[2], and A.P. Pisano[3]
[1]Children's Hospital Oakland, USA, [2]Korea Advanced Institute of Science and Technology (KAIST), KOREA, and [3]University of California, Berkeley, USA

10:40 **STRETCHABLE SUBSTRATES FOR THE MEASUREMENT OF INTRACELLULAR CALCIUM ION CONCENTRATION RESPONDING TO MECHANICAL STRESS** 68
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University of Tokyo, JAPAN

11:00 **EXHIBIT INSPECTION AND BREAK**

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Session Chairs:
D. Elata, Technion, *Israel Institute of Technology, ISRAEL*
M. Wong, *Hong Kong University of Science and Technology, HONG KONG*

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[1]Delft University of Technology, THE NETHERLANDS and [2]Haldor Topsøe A/S, DENMARK

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J. Han[1], M. Uchic[2], and T. Saif[1]
[1]University of Illinois, Urbana-Champaign, USA and [2]Wright-Patterson Air Force Base, USA

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J.-K. Kim, Y. Zhang, and D.-W. Lee
Chonnam National University, KOREA

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Analog Devices, USA

13:10 **MEMS 2010 ANNOUNCEMENT**

13:20 **EXHIBIT INSPECTION AND LUNCH**

14:30 - 16:30 **POSTER/ORAL SESSION II**

Session Chairs:
J.-U. Bu, *SenPlus Inc., KOREA*
S. Konishi, *Ritsumeikan University, JAPAN*

SESSION VII PHYSICAL MEMS

Session Chairs:
O. Brand, *Georgia Institute of Technology, USA*
U.M. Gomez, *Robert Bosch GmbH, GERMANY*

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Arizona State University, USA

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Peking University, CHINA

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H. Tao[1], A. Strikwerda[1], K. Fan[1], W.J. Padilla[2], R.D. Averitt[1], and X. Zhang[1]
[1]*Boston University, USA and* [2]*Boston College, USA*

Wednesday, 28 January 2009

09:00 **INVITED SPEAKER III**

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Seiji Samukawa
Tohoku University, JAPAN

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Session Chairs:
G.-B. Lee, *National Cheng Kung University, TAIWAN*
L. Lin, *University of California, Berkeley, USA*

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B.D. Davidson, Y.J. Chang, D. Seghete, S.M. George, and V.M. Bright
University of Colorado, USA

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Nagoya University, JAPAN

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B.D. Sosnowchik[1], P.J. Schuck[2], J. Chang[1], and L. Lin[1]
[1]University of California, Berkeley, USA and [2]Lawrence Berkeley National Laboratory, USA

10:40 **MICROELECTROMECHANICAL METAL-AIR-INSULATOR-SEMICONDUCTOR (MEM-MAIS) DIODE: A NOVEL HYBRID DEVICE FOR ESD PROTECTION** 132
D. Acquaviva[1,3], D. Tsamados[1], Ph. Coronel[2], T. Skotnicki[3], and A.M. Ionescu[1]
[1]Ecole Superieure d'Ingenieurs en Electrotechnique et Electronique (EPFL), SWITZERLAND,
[2]LITEN-CEA, FRANCE, and [3]ST Microelectronics, FRANCE

11:00 **EXHIBIT INSPECTION AND BREAK**

SESSION IX FABRICATION AND PACKAGING

Session Chairs:
J.M. Miao, *Nanyang Technological University, SINGAPORE*
B. Pruitt, *Stanford University, USA*

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A. Witvrouw[1], H.A.C. Tilmans[1], L. Bogaerts[1], P. De Moor[1], T. Bearda[1], S. Halder[1], L. Haspeslagh[1], B. Schlatmann[2], M. van Bommel[2], C. de Nooijer[2], J. Lauria[3], R. Vanneer[4], and B. van Drieenhuizen[4]
[1]Interuniversity Microelectronics Centre (IMEC), BELGIUM, [2]Philips Applied Technologies, THE NETHERLANDS,
[3]ASML, USA, and [4]ASML, THE NETHERLANDS

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V. Rajaraman, L.S. Pakula, H.T.M. Pham, P.M. Sarro, and P.J. French
Delft University of Technology, THE NETHERLANDS

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G. Villanueva, O. Vazquez-Mena, C. Hibert, and J. Brugger
Ecole Superieure d'Ingenieurs en Electrotechnique et Electronique (EPFL), SWITZERLAND

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B.-K. Lee, Y.-H. Song, and J.-B. Yoon
Korea Advanced Institute of Science and Technology (KAIST), KOREA

12:50 **ADVANCEMENTS IN TECHNOLOGY AND DESIGN OF BIOMIMETIC FLOW-SENSOR ARRAYS** 152
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University of Twente, THE NETHERLANDS

13:10 **EXHIBIT INSPECTION AND LUNCH**

14:30 - 16:30 **POSTER/ORAL SESSION III**

Session Chairs:
G.K. Fedder, *Carnegie Mellon University, USA*
Y.B. Gianchandani, *University of Michigan, USA*

SESSION X OPTICAL MEMS

Session Chair:
L. Lin, *University of California, Berkeley, USA*
H. Zappe, *University of Freiburg, GERMANY*

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C.-H. Kim, K.-D. Jung, and W. Kim
Samsung Electronics Co., Ltd., KOREA

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W. Choi[1], M. Akbarian[2], V. Rubtsov[2], and C.-J. Kim[1]
[1]University of California, Los Angeles, USA and [2]Intelligent Optical Systems, Inc. (IOS), USA

17:10 **RESONANT FREQUENCY TUNING OF TORSIONAL MICROSCANNER BY MECHANICAL RESTRICTION USING MEMS ACTUATOR** 164
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Yonsei University, KOREA

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University of Tokyo, JAPAN

17:50 **FORMATION AND INTEGRATION OF A BALL LENS UTILIZING TWO PHASES LIQUID TECHNOLOGY** 172
C.-C. Lee, S.-Y. Hsiao, and W. Fang
National Tsing Hua University, TAIWAN

18:10 **TEMPERATURE-CONTROLLED TRANSFER AND SELF-WIRING FOR MULTI-COLOR LED DISPLAY ON A FLEXIBLE SUBSTRATE** 176
E. Iwase, H. Onoe, A. Nakai, K. Matsumoto, and I. Shimoyama
University of Tokyo, JAPAN

19:30 - 23:00 **CONFERENCE BANQUET - Sponsored by STMicroelectronics**

Thursday, 29 October 2009

09:00 - 11:00 **POSTER/ORAL SESSION IV**
Session Chairs:
T. Akin, *Middle East Technical University, TURKEY*
O. Paul, *University of Freiburg - IMTEK, GERMANY*

10:30 **Refreshments Served**

SESSION XI BIOMEMS

Session Chairs:
K. Böhringer, *University of Washington, USA*
K. Sawada, *Toyohashi University of Technology, JAPAN*

11:00 **MICROFLUIDIC ODORANT SENSOR WITH FROG EGGS EXPRESSING OLFACTORY RECEPTORS** 180
N. Misawa[1], H. Mitsuno[1], R. Kanzaki[1], and S. Takeuchi[1,2]
[1]University of Tokyo, JAPAN and [2]Japan Science and Technology Agency (JST), JAPAN

11:20 **SEQUENTIAL AND SELECTIVE SELF-ASSEMBLY OF MICRO COMPONENTS BY DNA GRAFTED POLYMER** 184
T. Tanemura[1], G. Lopez[1], R. Sato[1], K. Sugano[1], T. Tsuchiya[1], O. Tabata[1], M. Fujita[2], and M. Maeda[2]
[1]Kyoto University, JAPAN and [2]RIKEN, JAPAN

11:40 **PIEZORESISTIVE CANTILEVER-BASED FORCE-CLAMP SYSTEM FOR THE STUDY OF MECHANOTRANSDUCTION IN C. ELEGANS** 188
S.-J. Park, B. Petzold, M.B. Goodman, and B.L. Pruitt
Stanford University, USA

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[1]Toyohashi University of Technology, JAPAN, [2]National Institute of Advanced Industrial Science and Technology, JAPAN, [3]Japan Society for the Promotion of Science, JAPAN, and [4]Japan Science and Technology Agency (JST), JAPAN

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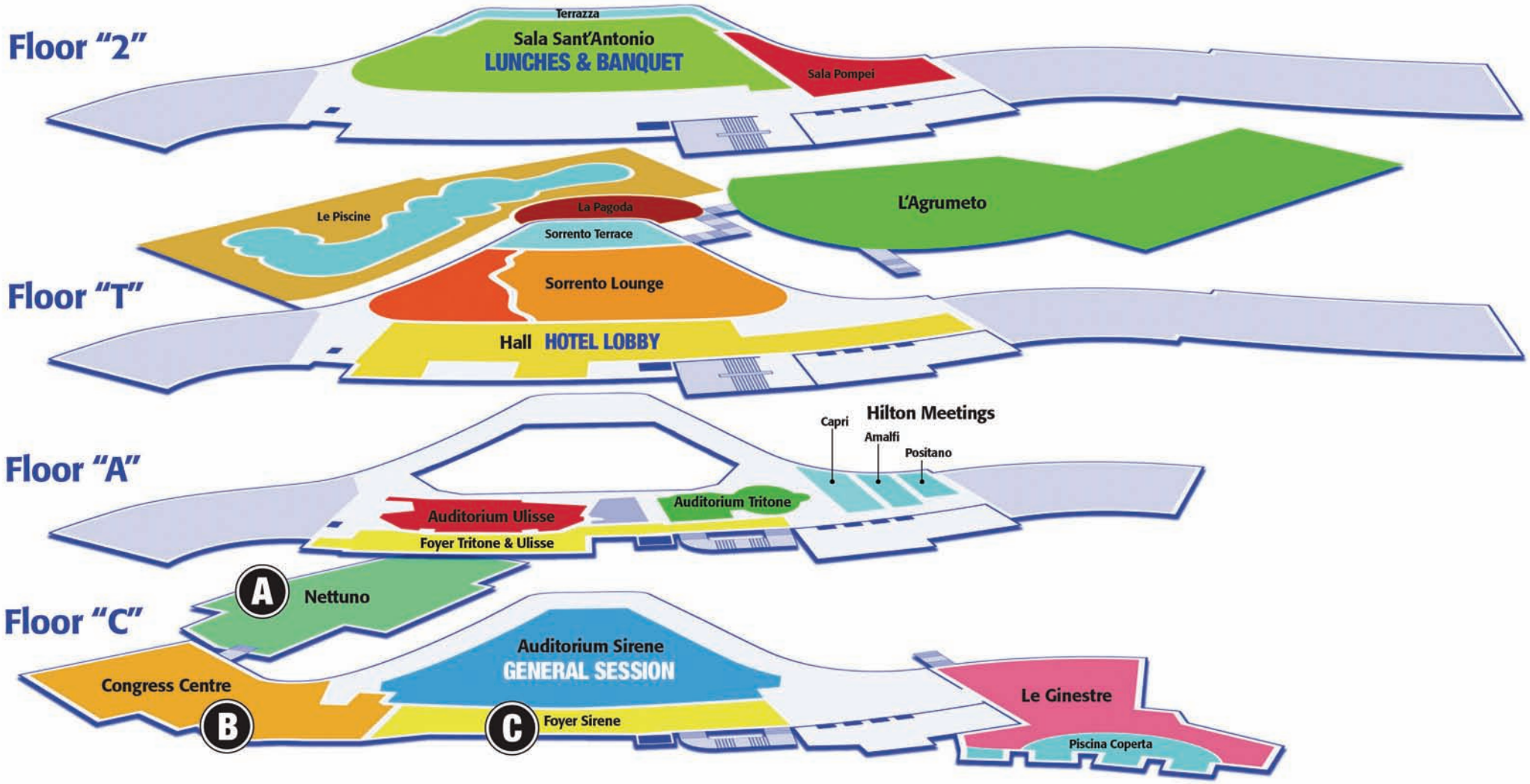
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