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Technology for Ultra-Large Scale Integrated  
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Proceedings

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5-21-2017

# Conference Program

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*Program*

**ULSIC vs TFT: 6<sup>th</sup> International Conference on  
Semiconductor Technology for Ultra Large Scale  
Integrated Circuits and Thin Film Transistors**

May 21 - 25, 2017

Schloss Hernstein  
Hernstein, Austria

Conference Chair

Prof. Yue Kuo  
Texas A&M University, USA

Conference Co-Chair

Prof. Olivier Bonnaud  
University of Rennes I, France



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## **Sunday, May 21, 2017**

16:00 - 17:30	Conference Check-in
17:30 - 19:00	Wine Tasting Reception
19:00 - 20:00	Dinner
20:00 - 21:30	Free communication

### ***NOTES***

- Technical sessions will be in the Studio.
- Meals will be held in the Panorama Restaurant.
- Audiotaping, videotaping and photography of presentations are prohibited.
- Speakers – Please leave at least 5 minutes for questions and discussion.
- Speakers – Please ensure your talk adheres to your given time allotment. Talks that go over their allotment reduce time for valuable discussion and can disrupt the conference program.
- Turn your cellular telephones to vibrate or off during technical sessions.
- After the conference, ECI will send an updated participant list to all participants. Please check your listing now and if it needs updating, you may correct it at any time by logging into your ECI account.
- Please do not smoke at any conference functions.
- Please write your name in the front of this program booklet so it can be returned if misplaced.

**Monday, May 22, 2017**

07:30 - 08:30 Breakfast

08:30 - 08:40 Introductions  
Yue Kuo, Conference Chair  
Norman Li, ECI Liaison

**IC + TFT Technologies**

**Session Chairs:** Yue Kuo, Texas A&M University, USA  
Olivier Bonnaud, IETR Univ-Rennes 1, France

08:40 - 09:10 **Gravimetric and biological sensors based on SAW and FBAR technologies**  
William Milne, Cambridge University, United Kingdom  
*Girish Rughoobur, Mario de Miguel Ramos, I.Miele, A.J.Flewitt, Cambridge University, United Kingdom; T.Mirea, M.Clement, J.Olivares, B. Diaz-Duran, J.Sangrador, E.Iborra Universidad Politcnica de Madrid, Spain*

09:10 - 09:40 **TFT & ULSIC: Interfacing large-area thin-film sensor arrays with CMOS circuits**  
Sigurd Wagner, Princeton University, USA  
*Yasmin Afsar, Tiffany Moy, Josue Sanz-Robinson, Warren Rieutort-Louis, Yingzhe Hu, Liechao Huang, James C. Sturm, Naveen Verma, Princeton University, USA*

09:40 - 10:10 **Large scale graphene integration for silicon technologies**  
Andreas Mai, IHP, Germany  
*Marco Lisker, Mindaugas Lukosius, Grzegorz Lupina, IHP, Germany*

10:10 - 10:40 **SiGeSn/GeSn hetero- and multiple quantum well structures for optoelectronics on Si**  
Detlev Grützmacher, Forschungszentrum Jülich, Germany  
*Nils von den Driesch, Daniela Stange, Dan Buca, Forschungszentrum Jülich, Germany*

10:40 - 11:10 Coffee Break

**TFT non-display applications**

**Session Chairs:** Gennadi Bersuker, The Aerospace Corporation, USA  
Sigurd Wagner, Princeton University, USA

11:10 - 11:40 **Neuromorphic application of oxide semiconductors**  
Mutsumi Kimura, Ryukoku University, Japan  
*Tokiyoshi Matsuda, Ryukoku University, Japan; Tomoya Kameda, Yasuhiko Nakashima, Nara Institute of Science and Technology, Japan*



**Monday, May 22, 2017 (continued)**

- 11:40 - 12:10      **Brain-like synapse thin-film transistors using oxide semiconductor channels and solid electrolytic gate insulators**  
Sung-Min Yoon, Kyung Hee University, South Korea  
*Yeo-Myeong Kim, Eom-Ji Kim, Kyung Hee University, South Korea*
- 12:10 - 12:40      **Visible and near-infrared photo-detector combining polysilicon TFT and PbS quantum dots**  
Tayeb Mohammed-Brahim, Rennes 1 University, France  
*Emmanuel Jacques, Rennes 1 University, France; Xiang Liu, Lei Wei, Southeast University, China*
- 12:45 - 14:00      Lunch
- 14:00 - 14:30      **Oxide TFTs for digital holography**  
Chi-Sun Hwang, ETRI, South Korea
- 14:30 - 14:50      **Low-power display system enabled by combining oxide semiconductor and neural network technologies**  
Hitoshi Kunitake, Semiconductor Energy Laboratory Co., Ltd., Japan  
*Shintaro Harada, Fumika Akasawa, Yuki Okamoto, Takashi Nakagawa, Takeshi Aoki, Seiichi Yoneda, Hiroki Inoue, Munehiro Kozuma, Takayuki Ikeda, Yoshiyuki Kurokawa, Shunpei Yamazaki, Semiconductor Energy Laboratory Co., Ltd., Japan*
- 14:50 - 15:10      **Atomic layer deposition: Low temperature process well adapted to ULSI and TFT technologies**  
Ahmad Chaker, University Grenoble Alpes, CNRS, France  
*Pierre Szkutnik, Patrice Gonon, Christophe Vallée, Ahmad Bsiesy, University Grenoble Alpes, CNRS, France*
- 15:10 - 19:00      *ad hoc sessions / Free time*  
  
(Optional) Tour of historic Schloss Hernstein 15:15 – 16:15 (conducted by Peter Glaser)  
Meet at lobby reception at 15:15
- 19:00 - 20:15      Dinner
- 20:15 - 21:45      **Panel Discussion: IC vs, TFT Applications** (followed by social hour)

**Tuesday, May 23, 2017**

07:30 - 08:30 Breakfast

**2D & Novel devices**

**Session Chairs:** William Milne, Cambridge University, United Kingdom  
Chi-Sun Hwang, ETRI, South Korea

08:30 - 09:00 **Gap engineering and reliability study for 2D electronics**  
Kosuke Nagashio, The University of Tokyo, Japan

09:00 - 09:30 **Integration of 2D materials for advanced devices: Challenges and opportunities**  
Robert M. Wallace, University of Texas at Dallas, USA

09:30 - 10:00 **Photoemission study of gate dielectrics on gallium nitride**  
Seiichi Miyazaki, Nagoya University, Japan  
*Nguyen Xuan Truyen, Akio Ohta, Nagoya University, Japan*

10:00 - 10:30 **Multifunctional amorphous metal oxide thin films – Structure transformation for various functions**  
Yue Kuo, Texas A&M University, USA

10:30 - 11:00 Coffee Break

**Flexible and memory TFTs**

**Session Chairs:** Junichi Murota, Tohoku University, Japan  
Andrew Flewitt, Cambridge University, United Kingdom

11:00 - 11:30 **Oxide thin film transistors for flexible devices**  
Yukiharu Uraoka, Nara Institute of Science and Technology, Japan  
*Juan Paolo Bermundo, Mami Fujii, Mutsunori Uenuma, Yasuaki Ishikawa, Nara Institute of Science and Technology, Japan*

11:30 - 12:00 **Low-temperature processed InGaZnO MES-FET for flexible device applications**  
Mamoru Furuta, Kochi University of Technology, Japan  
*Shinsuke Hashimoto, Kenichiro Hamada, Yusaku Magari, Kochi University of Technology, Japan*

12:00 - 12:30 **Oxide semiconductor based charge trap device for vertically integrated NAND flash memory**  
Cheol Seong Hwang, Seoul National University, South Korea

12:30 - 13:00 **Oxide thin films for sustainable, multifunctional and flexible electronics**  
Pedro Barquinha, CEMOP-UNINOVA, Portugal  
*Pydi Bahubalindrani, Okhla Industrial Estate, India*

13:15 - 13:30 Boxed Lunch (pick up in reception lobby)

**Tuesday, May 23, 2017 (continued)**

- 13:30 - 18:30            Excursion to Vienna / *ad hoc* sessions
- 19:00 - 20:00            Dinner
- 20:00 - 20:30            **TFT and ULSI technologies: The parallel evolution of the research and the higher education in France**  
Olivier Bonnaud, University of Rennes 1 & GIP-CNFM, France
- 20:30 - 21:00            **Devices in advanced technology nodes: Application-specific characterization**  
Gennadi Bersuker, The Aerospace Corporation, USA
- 21:00 - 22:30            **Panel Discussion: Challenges in solid state science & technology learning** (followed by social hour)

**Wednesday, May 24, 2017**

07:30 - 08:30 Breakfast

**Fabrication, reliability, materials I**

**Session Chairs:** Olivier Bonnaud, IETR Univ-Rennes 1, France  
Mamoru Furuta, Kochi University of Technology, Japan

08:30 - 09:00 **Atomically controlled processing for dopant segregation in CVD silicon and germanium epitaxial growth**  
Junichi Murota, Tohoku University, Japan  
*Yuji Yamamoto, Ioan Costina, IHP, Germany; Bernd Tillack, IHP and TU Berlin, Germany; Vinh Le Thanh, Aix Marseille University, France; Roger Loo, Matty Caymax, imec, Belgium*

09:00 - 09:30 **Carrier density dependent energy band-gap and phonon frequency in Ge**  
Akira Toriumi, University of Tokyo, Japan

09:30 - 10:00 **Electrically detected magnetic resonance in SiC MOSFETs utilizing multiple techniques**  
Patrick M. Lenahan, Pennsylvania State University, USA  
*Mark A. Anders, Pennsylvania State University, USA*

10:00 - 10:30 **Recent key developments in nanoscale reliability and failure analysis techniques for advanced nanoelectronics devices**  
Kin Leong Pey, Singapore University of Technology and Design, Singapore  
*A. Ranjan, S. Mei, Singapore University of Technology and Design and A\*STAR, Singapore; N. Raghavan, K. Shubhakar, Singapore University of Technology and Design, Singapore; M. Bosman, S.J. O'Shea, A\*STAR, Singapore*

10:30 - 11:00 Coffee Break

**Fabrication, reliability, materials II**

**Session Chairs:** Akira Toriumi, University of Tokyo, Japan  
Patrick M. Lenahan, Pennsylvania State University, USA

11:00 - 11:30 **Model prediction of stochastic effects of plasma-induced damage in advanced electronic devices**  
Koji Eriguchi, Kyoto University, Japan

11:30 - 12:00 **Advances in large PECVD processing technology up to Gen 11 for TFT LCD and OLED**  
Yi Cui, Applied Materials, Inc., USA  
*Beom Soo Park, Gaku Furuta, Jinhyun Cho, Soo Young Choi, Robin Tiner, Allen Lau, Suhail Anwar, Applied Materials, Inc., USA*

**Wednesday, May 24, 2017 (continued)**

- 12:00 - 12:30      **Printed poly-Si TFTs on paper via liquid-Si**  
*Ryoichi Ishihara, Delft University of Technology, Netherlands*  
*Miki Trifunovic, Paolo Sberna, Delft University of Technology, Netherlands;*  
*Tatsuya Shimoda, Japan Advanced Institute of Science and Technology, Japan*
- 12:30 - 14:00      Lunch
- 14:00 - 14:30      **Role of carrier injection in degradation of amorphous oxide films**  
*Alexander Shluger, University College London, United Kingdom*  
*David Gao, Jack Strand, Oliver Dicks, University College London, United*  
*Kingdom; Moloud Kaviani, WPI-Advanced Institute for Materials Research,*  
*Japan*
- 14:30 - 15:00      **Equilibrium mobility in IGZO TFT: Existence of the intermediate**  
**boolehand phase?**  
*Dieter G. Ast, Cornell University, USA*
- 15:00 - 17:30      Free time for recreation / discussions
- 17:30 - 18:30      **Panel Discussion: Challenges in giga and nano fabrication /Free**  
**Discussions**
- 19:00 - 21:00      Reception & Banquet

**Thursday, May 25, 2017**

07:30 - 08:30 Breakfast

**IC Memories**

**Session Chairs:** Michael Shur, Rensselaer Polytechnic Institute, USA  
Yukiharu Uraoka, Nara Institute of Science and Technology,  
Japan

08:30 - 09:00 **Single defect characterization at Si/SiO<sub>2</sub> interface**  
Toshiaki Tsuchiya, Shimane University, Japan

09:00 - 09:30 **Trapping mechanism of charge trap capacitor with Al<sub>2</sub>O<sub>3</sub>/High-k/Al<sub>2</sub>O<sub>3</sub> multilayer**  
Toshihide Nabatame, National Institute for Materials Science, Japan

09:30 - 10:00 **Two-terminal vertical thyristor-based capacitorless memory cells using latch-up features**  
Min-Won Kim, Hanyang University, South Korea  
*Seung-Hyun Song, Sang-Dong Yoo, Tae-Hun Shim, Jin Pyo Hong, Jea-Gun Park, Hanyang University, South Korea*

10:00 - 10:30 **Advanced measurement techniques for the characterization of ReRAM devices**  
Albert Crespo-Yepes, Universitat Autònoma de Barcelona, Spain  
*M. Nafria, R. Rodriguez, M. Porti, J. Martin-Martinez, S. Claramunt, X. Aymerich, Universitat Autònoma de Barcelona, Spain*

10:30 - 11:00 Coffee Break

**TFT Devices**

**Session Chairs:** Dieter G. Ast, Cornell University, USA  
Toshihide Nabatame, National Institute for Materials Science,  
Japan

11:00 - 11:30 **Thin film transistor modeling: Frequency dispersion**  
Michael Shur, Rensselaer Polytechnic Institute, USA

11:30 - 12:00 **Instability mechanisms in amorphous oxide semiconductors leading to a threshold voltage shift in thin film transistors**  
Andrew J. Flewitt, Cambridge University, United Kingdom  
*Kham M. Niang, Cambridge University, United Kingdom*

12:00 - 12:30 **Improvement in carrier mobility of metal oxide thin-film transistor by a microstructure modification**  
Jae Kyeong Jeong, Hanyang University, South Korea  
*Yeonwoo Shin, Sang Tae Kim, Hanyang University, South Korea*

**Thursday, May 25, 2017 (continued)**

- 12:30 - 13:00      **Embedded oxide semiconductor memories: A key enabler for low-power ULSI**  
*Takahiko Ishizu, Semiconductor Energy Laboratory Co., Ltd., Japan*  
*Tatsuya Onuki, Shuhei Nagatsuka, Momoyo Yamaguchi, Atsuo Isobe,*  
*Yoshinori Ando, Daisuke Matsubayashi, Kiyoshi Kato, Semiconductor Energy*  
*Laboratory Co., Ltd., Japan; Hai Biao Yao, Chi Chang Shuai, Hung Chan Lin,*  
*United Microelectronics Corporation (UMC), Taiwan*
- 13:00 - 13:10      Conclusions / Next Conference
- 13:15 - 14:30      Lunch and Departures