2017 INTERNATIONAL IMAGE SENSOR WORKSHOP
Grand Prince Hotel Hiroshima
May 30th - June 2nd, 2017 Hiroshima, Japan

PROGRAM

Tuesday, May 30th 2017

08:00-08:30  Registration
             Welcome
08:30-08:45  Opening

Session 01  Stacked Image Sensors
            Session chair: Yusuke Oike (Sony)
            Dun-Nien Yaung (TSMC)

08:45-09:00  An Advanced CuCu Hybrid Bonding For Novel Stacked CMOS Image Sensor
             R01
             Y. Kagawa¹, N. Fujii², K. Aoyagi², Y. Kobayashi², S. Nishi¹, N. Todaka¹,
             S. Takeshita¹, J. Taura¹, H. Takahashi², Y. Nishimura², K. Tatani²,
             M. Kawamura¹, H. Nakayama¹, T. Nagano², K. Ohno², H. Iwamoto²,
             S. Kadomura¹, T. Hirayama². ¹Sony Semiconductor Manufacturing, Japan; ²Sony
             Semiconductor Solutions, Japan

09:00-09:15  A 3D Stacked Programmable Image Processing Engine in a 40nm Logic Process
             with a Detector Array in a 45nm CMOS Image Sensor Technologies
             R02
             Biay-Cheng Hseih¹, Keith Honea¹, Sami Khawam¹, Sergio Goma¹, RJ Lin²,
             Chin-Hao Chang², Charles Liu², Shang-Fu Yeh², Hong-Yi Tu²,
             Kuo-Yu Chou², Calvin Chao². ¹Qualcomm Technologies Inc., USA; ²TSMC,
             Taiwan, ROC

09:15-09:30  1.0µm Pixel Improvements with Hybrid Bond Stacking Technology
             R03
             V.C. Venezia, C. Shih, W.Z. Yang, Y. Zang, Z. Lin, Lindsay Grant, and
             Howard Rhodes. Omnivision Technologies, USA

09:30-09:45  Vertically Integrated Edgeless Photon Imaging Camera
             R04
             Farah Fahim, Grzegorz Deptuch, Alpana Shenai, Piotr Maj, Piotr Kmon,
             Pawel Grybos, Robert Szczygiel, D. Peter Siddons, Abdul Rumaiz,
             Anthony Kuczewski, Joseph Mead, Rebecca Bradford, John Weizeorick . Fermi
             National Laboratory, USA

09:45-10:00  Low Dark Current and Low Noise 0.9 µm Pixel in a 45 nm Stacked CMOS Image
             Sensor Process Technology
             R05
             Seiji Takahashi, Yi-Min Huang, Jhy-Jyi Sze, Tung-Ting Wu, Fu-Sheng Guo,
             Wei-Cheng Hsu, Tung-Hsiung Tseng, Chia-Ching Liao, Chin-Chia Kuo,
             Tzu-Hsiang Chen, Wei-Chieh Chiang, Chun-Hao Chuang, Keng-Yu Chou,
             Chi-Hsien Chung, Kuo-Yu Chou, Chien-Hsien Tseng, Chuan-Joung Wang and
             Dun-Nien Yaung. Taiwan Semiconductor Manufacturing Company, Taiwan, ROC
10:00-10:15  A Survey of Enabling Technologies in Successful Consumer Digital Imaging
R06  Ray Fontaine. TechInsights, Inc., Canada

10:15-10:40  Break

Session 02  Noise
Session chair: Boyd Fowler (OmniVision Technologies)
Hidekazu Takahashi (Canon)

10:40-10:55  Dark Current Limiting Mechanisms in CMOS Image Sensors
R07  Dan McGrath¹, Steve Tobin¹, Vincent Goiffon², Marius Sergent², Pierre Magnan².
¹BAE Systems, USA; ISAE-SUPAERO, Université de Toulouse, France

10:55-11:10  Development of Low Noise Memory Node in a 2.8um Global Shutter Pixel with Dual Transfer
R08  Masafumi Tsutsui¹, Tatsuya Hirata¹, Keishi Tachikawa¹, Ikuo Mizuno¹,
Masakatsu Suzuki¹, Dmitry Veinger², Adi Birman² & Assaf Lahav². ¹TowerJazz
Panasonic Semiconductor Co. Ltd., Japan; ²TowerJazz, Migdal Haemek, Israel

11:10-11:25  Temporal Noise Improvement Using the Selective Application of the Fluorine Implantation in the CMOS Image Sensor
R09  Man-Lyun Ha, Min-Kyu Kang, Sang-Won Yoon, Chang-Hoon Han, Juil Lee, and Yoon-Jong Lee. Dongbu HiTek, Korea

11:25-11:40  Random Telegraph Noise Pixel Classification and Time Constant Extraction for a 1.1µm 8.3MP CMOS Image Sensor
R10  Calvin Chao, Honyih Tu, Thomas Wu, Kuo-Yu Chou, Shang-Fu Yeh, and Fu-Lung Hsueh. Taiwan Semiconductor Manufacturing Company, Taiwan, ROC

11:40-11:55  Statistical Analysis of Random Telegraph Noise in Source Follower Transistors with Various Shapes
R11  Shinya Ichino¹, Takezo Mawaki¹, Shunichi Kashima¹, Akinobu Teramoto²,
Rihito Kuroda¹, Phillipe Gaubert², Tetsuya Goto², Tomoyuki Suwa² and Shigetoshi Sugawa¹². ¹Graduate School of Engineering, Tohoku University, Japan; ²New Industry Creation Hatchery Center, Tohoku University, Japan

11:55-12:10  Impact of Random Telegraph Noise with Various Time Constants and Number of States in CMOS Image Sensors
R12  Rihito Kuroda¹, Akinobu Teramoto² and Shigetoshi Sugawa¹². ¹Graduate School of Engineering, Tohoku University, Japan; ²New Industry Creation Hatchery Center, Tohoku University, Japan

12:10-13:45  Lunch
A Spectral Imaging System with an Over 70dB SNR CMOS Image Sensor and Electrically Tunable 10nm FWHM Multi-Bandpass Filter

Yasuyuki Fujihara, Yusuke Aoyagi, Satoshi Nasuno, Shunichi Wakashima, Rihiito Kuroda, Kohei Terashima, Takahiro Ishinabe, Hideo Fujikake, Kazuhiro Wako, Shigetoshi Sugawa. Tohoku University, Japan; National Institute of Technology, Sendai College, Japan

A Study on “On Chip Hybrid IRC Technology” to Provide a Thinner Solution for CIS

Li-Kai Lee, Chih-Chieh Chang, Yu-Kun Hsiao, JC Hsieh, Kazuaki Hashimoto, Chien-Hsien Tseng, Chun-Hao Chuang, Wei-Chieh Chiang. VisEra Technologies Company, Taiwan; Taiwan Semiconductor Manufacturing Company, Taiwan

Quantum Efficiency Simulation with Boltzmann Transport Equation for Motion Modeling of Individual Particles in Photodiodes

Yuichiro Yamashita, Natsumi Minamitani, Masayuki Uchiyama, Yoshinari Kamakura, and Dun-Nian Yaung. Osaka University, Japan; CIS Product Development Section I, Taiwan Semiconductor Manufacturing Company, Ltd., Taiwan; CMOS Image Sensor Division, Taiwan Semiconductor Manufacturing Company, Ltd., Taiwan; CIS Sensing System Technology, Taiwan Semiconductor Manufacturing Company, Ltd., Taiwan

Nanostructured Metallic Color Filter for Wide-Range and Multi-Band Image Sensor

Atsushi Ono, Atsutaka Miyamichi, Hiroki Kamehama, Keiichiro Kagawa, Keita Yasutomi, and Shoji Kawahito. Research Institute of Electronics, Shizuoka University, Japan; Graduate School of Integrated Science and Technology, Shizuoka University, Japan

Lens Solution for Intensity Enhancement in Large-Pixel Single-Photon Avalanche Diode


Break
P01  A Proposal of PUF Utilizing Pixel Variations in a CMOS Image Sensor
Shunsuke Okura¹, Yuki Nakura², Masayoshi Shirahata³, Mitsuru Shiozaki³, Takaya Kubota³, Kenichiro Ishikawa¹, Isao Takayanagi¹, and Takashi Fujino⁴.
¹ Brillnics Japan Inc., Japan; ² Graduate School of Science and Technology Ritsumeikan University, Japan; ³ Department of Science and Engineering Ritsumeikan University, Japan; ⁴ Research Organization of Science and Engineering Ritsumeikan University, Japan

P02  A Miniature Imaging Device Using a Self-Reset Image Sensor for Hemodynamic Imaging
Nara Institute of Science and Technology, Japan

P03  CMOS Terahertz Imaging Pixel With a Small On-Chip Antenna
Shota Hiramatsu, Kosuke Wakita, Eiichi Sano, Seokjin Na, Sayuri Yokoyama, and Masayuki Ikebe.
Hokkaido University, Japan

P04  Investigations on Cryogenic Operation of Pinned Photodiode Pixels
Philippe Martin-Gonthier, Pierre Magnan, Olivier Marcelot.
ISAE-SUPAERO, Université de Toulouse, France

P05  Differential Digital Double Sampling Readout Scheme for a 4T 4-Shared Pixel with Reduced Interconnection
Jeroen Rotte¹, Peter Centen¹, Juul van den Heijkant¹, Adi Birman², Dmitry Veinger².
¹ Grass Valley, The Netherlands; ² TowerJazz, Israel

P06  Column-Parallel Dynamic TDC Reallocation in SPAD Sensor Module Fabricated in 180nm CMOS for Near Infrared Optical Tomography
Scott Lindner¹,², Chao Zhang³, Ivan Michel Antolovic², Juan Mata Pavia¹,², Martin Wolf², Edoardo Charbon¹,³.
¹ EPFL, Switzerland; ² University Hospital Zurich, Switzerland; ³ TUDelft, The Netherlands

P07  Extending the Dynamic Range of Oversampled Binary SPAD Image Sensors
Neale A.W. Dutton¹, Tarek Al Abbas², István Gyongy², Robert K. Henderson².
¹ STMicroelectronics, UK; ² The University of Edinburgh, UK

P09  Recent Enhancements to Electron Multiplying CCD Image Sensors
ON Semiconductor, USA
8.25µm Pitch 66% Fill Factor Global Shared Well SPAD Image Sensor in 40nm CMOS FSI Technology

T. Al Abbas¹, N.A.W. Dutton², O. Almer¹, S. Pellegrini², B. Rae², D. Golanski³, and R.K. Henderson¹.¹ The University of Edinburgh, UK; ² STMicroelectronics, UK; ³ STMicroelectronics, France

Two-Tier Geiger-Mode Avalanche Detector for Charged Particle Imaging

Lucio Pancheri¹, Andrea Ficorella¹, Paolo Brogi²,³, Gianmaria Collazuol⁴, Gian-Franco Dalla Betta¹, Pier Simone Marrocchesi²,³, Fabio Morsani³, Lodovico Ratti⁵, Aurore Savoy-Navarro⁶.¹ DII, Università di Trento and TIFPA-INFN, Italy; ² DFSTA, Università di Siena, Italy; ³ NFN Sezione di Pisa, Italy; ⁴ DFA, Università di Padova, and INFN Sezione di Padova, Italy; ⁵ DIII, Università di Pavia, and INFN Sezione di Pavia, Italy; ⁶ Laboratoire APC, University Paris-Diderot/CNRS, France

HAS3: A Radiation Tolerant CMOS Image Sensor for Space Applications

Manuel Innocent, Thomas Cools, Carl Luypaert, Cedric Esquenet, Wiet Vroom, Ishwar Chandra Mudegowdar, Ioannis Thanasopoulos, Patrick Pintens, Joost Decupere, Tomas Geurts. ON Semiconductor, Belgium

Fully Depleted, Monolithic Pinned Photodiode CMOS Image Sensor Using Reverse Substrate Bias

Konstantin D. Stefanov, Andrew S. Clarke, James Ivory and Andrew D. Holland. The Open University, UK


Rafal Kleczek, Pawel Grybos, Robert Szczygiel. AGH University of Science and Technology, Poland

An Imager with Five 20000 x 15 Pixel TDI CCDs for Photogrammetry Applications

Jan Bosiers, Erik-Jan Manoury, Harry van Kuijk, Wilco Klaassens, Holger Stoldt, René Leenen, Herman Peek, Walter de Laat. Teledyne DALSA Professional Imaging, The Netherlands

Charge-Coupled CMOS TDI Imager

Hyun Jung Lee, David Atos, Paul Donegan, Feng-Hua Feng, Eric Fox, Roula Ghannoum, Jason Guan, Tihomir Hodalin, Laurens Korthout, Willy Maes, David Marchesan, Brad Moon, Matt Moser, Mark Ruiter, Tsung-Hsuen Tsai. Teledyne DALSA Inc., Canada

Design and Characterization of a 3.5µm Pitch, 8192 Resolution, 5 Spectrum CMOS TDI Image Sensor

Xinyang Wang, Cheng Ma, Lanlan Liu, Quan Zhou, Yang Li. Gpixel Inc., China
P18 A 7-band CCD-in-CMOS Multispectral TDI Imager
David San Segundo Bello¹, Maarten De Bock¹, Pierre Boulenc¹, Roeland Van de Bavel¹, Linkun Wu¹,², Jan Van Olmen¹, Vezio Malandrucello¹, Jan Craininckx¹, Luc Haspeslagh¹, Stefano Guerrieri¹, Maarten Rosmeulen¹, Jonathan Borremans¹. ¹ imec, Belgium; ² Vrije Universiteit Brussel, Belgium

P19 A 1 x 16 SiPM Array for Automotive 3D Imaging LiDAR Systems
Salvatore Gnecchi, Carl Jackson. SensL Technologies, Ireland

P20 A 320x240 10um CAPD ToF Image Sensor with Improved Performance

P21 Simulating the Performance Required for Multi-Tap Charge Modulation Pixels in Time-Resolved Biomedical Imaging
Keiichiro Kagawa¹,², Nobukazu Teranishi¹,³, Keita Yasutomi¹, Rolf Saager², Min-Woong Seo¹, and Shoji Kawahito¹, Anthony Durkin², and Bruce Tromberg². ¹ Shizuoka University, Japan; ² Beckman Laser Institute, UC Irvine, USA; ³ University of Hyogo, Japan

16:25-16:45 Break

P22 Transfer-Gate Region Optimization and Pinned-Photodiode Shaping for High-Speed TOF Applications
Fabio Acerbi¹, Manuel Moreno Garcia¹, Gözen Köklü², Bernhard Buttgen², Radoslaw Gancarz², Alice Biber², Daniel Furrer², David Stoppa¹. ¹ Fondazione Bruno Kessler, Center for Material and Microsystems, Italy; ² Heptagon Advanced Micro Optics Pte Ltd., Switzerland

P24 Event-Driven Correlated Double Sampling for Pulse-Frequency-Modulation A/D Converters Integrated in Pixel-Parallel Image Sensors
Masahide Goto¹, Yuki Honda¹, Toshihisa Watabe¹, Kei Hagiwara¹, Masakazu Nanba¹, Yoshinori Iguchi¹, Takuya Saraya², Masaharu Kobayashi², Eiji Higurashi², Hiroshi Toshiyoshi², and Toshio Hiramoto². ¹ NHK Science and Technology Research Laboratories, Japan; ² The University of Tokyo, Japan

P25 Image Sensor With Multiple Sub-radix-2 SAR ADC Calibration and Residual Column Pattern Noise Correction
Daniel Van Blerkom, Steve Huang, Barmak Mansoorian. Forza Silicon Corporation, USA
A High-Speed Imager with Low-Power PTC-Inspired Column-Multiplexed Readout
Maarten De Bock, Mingxu Liu, Peter Van Wesemael, Annachiara Spagnolo, Jan Craninckx, Koen De Munck, Celso Cavaco, Luc Haspeslagh, Stefano Guerrieri, Maarten Rosmeulen, Jonathan Borremans. imec, Belgium

A Small Pixel High Performance Full Frame HDR Sensor
Salman Kabir, Michael Guidash, Thomas Vogelsang, Craig Smith, Alex Schneider, Jay Endsley. Rambus Inc., USA

QLOG - Logarithmic Pixel with Single Electron Detection Capability
Yang Ni. New Imaging Technologies, France

Back Side Illuminated High Dynamic Range 3.0µm Pixel Featuring Vertical p-n Junction Capacitance in A Deep Pinned Photodiode

How to Hand-Calculate MTF in Front-Side and Backside Illuminated Image Sensors
Bart Dierickx¹, Jean Bourgain², Bert Luyssaerticator. Institute for Advanced Study, USA

A Study on Photon Effect to Image Plane
Kangbong Seo, Sungryong Lee, Peter Ahn, Dohwan Kim and Kwangbo Cho. SK Hynix semiconductor Inc., Korea

PD Barrier Induced Lag Characterization Using a New Lag versus Idle Time Methodology
W. Gao, N. Li, M. Guidash, R. Ispasoiu, P. R. Ailuri, N. Palaniappan, D. Tekleab, M. Rahman. ON Semiconductor, USA

A CMOS Front-end for GaN-based UV Imaging
Preethi Padmanabhan¹, Bruce Hancock², Shouleh Nikzad², L. Douglas Bell², Kees Kroep³, Edoardo Charbon¹,² ¹AQUA Laboratory, EPFL, Switzerland; ²Jet Propulsion Laboratory, California Institute of Technology, USA; ³AQUA Laboratory, TU Delft, The Netherlands

Ultraviolet and Visible Spectral Imaging of Hydrogen Flames Using an Organic Photoconductive Film CMOS Imager
T. Okino, S. Yamahira, S. Yamada, Y. Hirose, A. Odagawa, Y. Kato and T. Tanaka. Panasonic Corporation, Japan
Low Dark Current UV-VIS Planar-electrode Perovskite CMOS Image Sensor

Yan-Rung Lin, Pei-Wen Yen, Sheng-Min Yu, Shiu-Cheng Lou, Kai-Ping Chuang, Bor-Nian Chuang, Yen-Chih Chiou, Chih-Cheng Hsieh, Cheng-Hung Hou, Feng-Yu Tsai. Industrial Technology Research Institute, Center for Measurement Standards, Material and Chemical Research Laboratories, Taiwan; National Tsing Hua University, Taiwan; National Taiwan University, Taiwan

A 5 Million fps Global Shutter Megapixel Sensor with Shutter Efficiency in Excess of 120 dB

K. Taylor, W. Chan, A. Birman, A. Lahav, A. Fenigstein, B. Marsh, S. Benhammadi, R. Turchetta. STFC Rutherford Appleton Laboratory, UK; Specialised Imaging, UK; TowerJazz Semiconductor Ltd., Israel; WegaPixel SL, Spain

A 10 µm pitch, SXGA Multifunctional IRFPA ROIC with In-Pixel Laser Event Detection and High Dynamic Range Imaging


A 78.3 µVrms Read Noise CMOS Image Sensor with SF Noise Reduction Technique Using Noise-Coupled Amplifier

Chanmin Park, Injun Park, Woo Jin Jo, Jimin Cheon, and Youngcheol Chae. Yonsei University, Korea; Kumoh National Institute of Technology, Korea

A New Radiation Hardened CMOS Image Sensor for Nuclear Plant


Optical Characteristics of Multi-Storied Photodiode CMOS Image Sensor with 3D Stacking Technology


Development of Vertical Thin Poly-Si Channel Structured TG for 3D CIS Pixel Applications

Young-Jun Kwon, Sung-Kun Park, Sung-Wook Cho, Kyoung-In Lee, Sung-Man Kim, Chris Hong, In-Wook Cho, Jae-Hyun Park, and Kyung-Dong Yoo. SK Hynix, Korea; Hanyang University, Korea
Three-Transistor-Pixel CMOS Image Sensor for 8K Super Hi-Vision Stacked Sensor with Highly Sensitive Photoconversion Layer

T. Watabe¹, Y. Honda¹, M. Nanba¹, T. Iida², T. Kosugi², H. Ohtake¹, and M. Kubota¹. ¹NHK Science and Technology Research Laboratories, Japan; ²Brookman Technology, Inc., Japan

Fresnel Zone Plates: Plasmonics Filtering for SPADS Sensors

Flavien Hirigoyen. STMicroelectronics, France

Wednesday, May 31st 2017

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<th>Session 05</th>
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<td>Session chair: Bart Dierickx (Caeleste)</td>
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<td>Neal Dutton (ST Microelectronics)</td>
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08:30-08:45 Experimental Comparison of MOSFET and JFET 1.1 µm Pitch Jots in 1Mjot Stacked BSI Quanta Image Sensors

R18 Jiaju Ma¹, Saleh Masoodian¹, Tzu-Jui Wang² and Eric R. Fossum¹. ¹Thayer School of Engineering at Dartmouth College, USA; ²Taiwan Semiconductor Manufacturing Company, Taiwan

08:45-09:00 A 1Mjot 1000fps 0.22e-rms Stacked BSI Quanta Image Sensor with Cluster-Parallel Readout

R19 Saleh Masoodian¹, Jiaju Ma¹, Dakota Starkey¹, Yuichiro Yamashita², and Eric R. Fossum¹. ¹Thayer School of Engineering, Dartmouth College, USA; ²Taiwan Semiconductor Manufacturing Company (TSMC), Taiwan

09:00-09:15 A 512×512 SPAD Image Sensor with Built-In Gating for Phasor Based Real-Time siFLIM

R20 Arin Can Ulku¹, Claudio Bruschini¹, Xavier Michalet², Shimon Weiss², Edoardo Charbon¹. ¹AQUA laboratory, EPFL, Switzerland; ²Department of Chemistry and Biochemistry, UCLA, USA

09:15-09:30 3 µm Pitch, 1 µm Active Diameter SPAD Arrays in 130nm CMOS Imaging Technology

R21 Ziyang You¹, Luca Parmesan¹*, Sara Pellegrini², Robert K. Henderson¹. ¹The University of Edinburgh, UK; ²STMicroelectronics, UK; *now with Fondazione Bruno Kessler, Italy

09:30-09:45 Object Tracking and Reconstruction with a Quanta Image Sensor

R22 Istvan Gyongy¹, Tarek Al Abbas¹, Neale A.W. Dutton², Robert K. Henderson¹. ¹The University of Edinburgh, U.K.; ²STMicroelectronics, U.K.
09:45-10:00  A Flexible 32x32 Dual-Side Single-Photon Image Sensor
R23 P. Sun, J. Weng, R. Ishihara and E. Charbon. Delft University of Technology, The
Netherlands

10:00-10:25  Break

Session 06  Invited Presentation and Range Imaging
Session chair: David Stoppa (Fondazione Bruno Kessler)
Gennadiy Agranov (Apple)

10:25-10:55  Invited Presentation-I
I1 Sensors for future AR/VR applications
Chiao Liu (Oculus VR Research, Facebook Inc.)

10:55-11:10  A High-Resolution Time-of-Flight Range Image Sensor with a 3-Tap Lateral
Electric Field Charge Modulator
R24 Keita Yasutomi, Shoma Imanishi, Yuki Morikawa, Taishi Takasawa,
Keiichiro Kagawa, Shoji Kawahito. Shizuoka University, Japan

11:10-11:25  Mutually Coupled Ring Oscillators for Large Array Time-of-Flight Imagers
R25 Augusto Ronchini Ximenes¹, Preethi Padmanabhan², and Edoardo Charbon¹².
¹ Delft University of Technology, The Netherlands; ² AQUA Laboratory, EPFL, Switzerland

11:25-11:40  3D Imaging with CMOS Single-Photon Detector Arrays for Space Applications:
Ground-Based Measurements and Irradiation Tests
R26 Matteo Perenzoni¹, Daniele Perenzoni¹, David Stoppa¹, Alexandre Pollini²,
Jacques Haesler², Christophe Pache². ¹ Fondazione Bruno Kessler, Italy; ² CSEM,
Neuchatel, Switzerland

11:40-11:55  Indirect ToF Pixel Integrating Fast Buried-Channel Transfer Gates and Gradual
Epitaxy, and Enabling CDS
R27 Boris RODRIGUES¹³, Marie GUILLON², Nicolas BILLON-PIERRON²,
Jean-Baptiste MANCINI², Olivier SAXOD², Benoit GIFFARD², Yvon CAZAUX²,
Pierre MALINGE³, Patrice WALTZ³, Auguste NGOUA³, Yannick KERLEGUER³,
Alisée TALUY³, Sarah KUSTER³, Sylvain JOBLOT³, François ROY³,
Guo-Neng LU¹. ¹ Institut des Nanotechnologies de Lyon, France; ² Univ. Grenoble
Alpes, France; ³ STMicroelectronics, France

11:55-12:10  A Low-Power Low-Cost High-Speed 2D/3D Camera for Virtual Reality Headsets,
Mobile Devices and Automobiles
R28 Yibing M. Wang¹³, Ilia Osviannikov¹³, Jang-Woo You³, Peter Deane²,
Dirk Smits², Yong-Hwa Park³, Maarten Niesten², Sungwoo Hwang³,
Chilhee Chung³. ¹ Samsung Semiconductor, Inc., USA; ² Samsung Strategy and
Innovation Center, USA; ³ Samsung Advanced Institute of Technology, Korea; ³ Now
with KAIST

12:10-13:45  Lunch
Session 07  High Dynamic Range
Session chair: Johannes Solhusvik (OmniVision Technologies)
Orly Yadid-Pecht (University of Calgary)

13:45-14:00  A 87dB Single Exposure Dynamic Range CMOS Image Sensor with a 3.0um Triple Conversion Gain Pixel

14:00-14:15  A Native HDR 115dB 3.2µm BSI Pixel Using Electrons and Holes Collection
R30  F. Lalanne, P. Malinge, D. Hérauld, C. Jamin. STMicroelectronics, France

14:15-14:30  A 98dB Linear Dynamic Range, High Speed CMOS Image Sensor
R31  Tomas Geurts, Bart Cremers, Manuel Innocent, Wiet Vroom, Cedric Esquenet, Thomas Cools, John Compiet, Burak Okcan, Genis Chapinal, Carl Luypaert, Patrick Pintens, Roel Aerts. ON Semiconductor, Belgium

14:30-14:45  A Method to Increase DR Using Column-Level Automatic Gain Selection
R32  Gaozhan Cai¹, Wei Wang¹, B.Luyssaert¹, B.Dierickx¹, G.Ruttens¹, J.Basteleus¹, J.De Vroe¹, W.Verbruggen¹, D. Uwaerts¹, B. Uwaerts¹, Peng.Gao¹, Denvir Donal², Philip Steen². ¹ Caeleste, Belgium; ² Andor Technology Ltd., UK

14:45-15:00  A 0.5e⁻ rms Temporal-Noise CMOS Image Sensor with Charge-Domain CDS and Period-Controlled Variable Conversion Gain
R33  Xiaoliang Ge¹, Albert Theuwissen¹,². ¹ Delft University of Technology, the Netherlands; ² Harvest Imaging, Belgium

15:00-15:15  140dB Sub-electron Noise Floor Image Sensor
R34  Sergey Velichko¹, Scott Johnson¹, Dan Pates¹, Chris Silsby¹, Cornelis Hoekstra², Ray Mentzer², Jeff Beck². ¹ ON Semiconductor, ID, USA; ² ON Semiconductor, OR, USA

15:15-15:30  A 1392x976 2.8µm 120dB CIS with Per-Pixel Controlled Conversion Gain
R35  Johannes Solhusvik¹, Ming-Hsuan Hsu², Sam Hu², Robert Johansson¹, Zhiqiang Lin², Siguang Ma², Keiji Mabuchi², Sohei Manabe², Duli Mao², Bill Phan², Howard Rhodes², Charles Shan², Eric Webster², and Trygve Willassen¹. ¹ OmniVision Technologies, Norway; ² OmniVision Technologies, USA

15:30-15:55  Break
15:55-16:25  Invited Presentation-II

I2  Extreme Imaging and Beyond
Keisuke Goda (The University of Tokyo)

16:25-16:40  The Temporal Resolution Limit of the Silicon Image Sensors
R36  Takeharu Goji Etoh1,2, Anh Quang Nguyen2, Yoshinari Kamakura1, Kazuhiro Shimonomura2, Yen Le Thi1 and Nobuya Mori1. 1 Osaka University, Japan; 2 Ritsumeikan University, Japan

16:40-16:55  10Mfps 960 Frames Video Capturing Using a UHS Global Shutter CMOS Image Sensor with High Density Analog Memories
R37  Manabu Suzuki1, Masashi Suzuki1, Rihito Kuroda1, Yuki Kumagai2, Akira Chiba2, Noriyuki Miura2, Naoya Kuriyama2 and Shigetoshi Sugawa1. 1 Tohoku University, Japan; 2 LAPIS Semiconductor Miyagi Co., Ltd., Japan

16:55-17:10  In-Pixel Storage Techniques for CMOS Burst-Mode Ultra-High-Speed Imagers
R38  L. Wu1,2, D. San Segundo Bello2, P. Coppejans2, A. Suess2, M. Rosmeulen2, J. Craninckx2, P. Wambacq1,2, J. Borremans2. 1 Vrije Universiteit Brussel, Belgium; 2 imec, Belgium

17:10-17:25  A 0.64 microseconds Row-Time CMOS Image Sensor using Gm-Enhanced Repeater Source Follower Buffer and Column Parallel Pipelined ADC
R39  Toshinori Otaka, Shintaro Maekawa, Hiroyuki Yamaguchi and Takayuki Hamamoto. Tokyo University of Science, Japan

17:25-17:40  Single Photon Counting Hybrid Pixel Detectors with 85 ns Dead Time, 70 kfps Frame Rate and TSV Option.
R40  P. Maj1, Eric Dufresne2, P. Grybos1, K. Kasinski1, P. Kmon1, A. Koziol1, Suresh Narayanan2, Alec Sandy2, R. Szczygiel1, Qingteng Zhang2. 1 AGH University of Science and Technology, Poland; 2 Argonne National Laboratory, USA

Thursday, June 1st 2017

08:20-08:35  A SAR-ΔΣADC with Dynamic Integrator for Low-Noise CMOS Image Sensors
R41  Akira Matsuzawa, and Masaya Miyahara. Tokyo Institute of Technology, Japan
08:35-08:50  A 12-bit Column-Parallel Flash TDC-Interpolated Ramp ADC with Online Digital Delay Element Correction
R42  Deyan Levski¹, Martin Wany², Bhaskay Choubey¹. ¹ University of Oxford, UK; ² Austria Microsystems AG., Portugal

08:50-09:05  A 12-bit, 0.9-μs Single-Slope ADC for Embedded TDI-CCD and CMOS Line-Scan Image Sensor
R43  Tsung-Hsun Tsai, Paul Donegan, David Atos, Feng-Hua Feng, Eric Fox, Roula Ghannoum, Jason Guan, Tihomir Hodalin, Hyun Jung Lee, Willy Maes, David Marchesan, Brad Moon, Matt Moser, Mark Ruiter, and Laurens Korthout. Teledyne DALSA Inc., Canada

09:05-09:20  A Highly Linear CMOS Image Sensor with a Digitally Assisted Calibration Method
R44  Fei Wang¹, Liqiang Han², Albert J. P. Theuwissen¹,³. ¹ Delft University of Technology, The Netherlands; ² Tianjin University, China; ³ Harvest Imaging, Belgium

09:20-09:35  A 5-Megapixel 100-frames-per-second 0.5erms Low Noise CMOS Image Sensor With Column-Parallel Two-Stage Oversampled Analog-to-Digital Converter
R45  J. A. Segovia¹, F. Medeiro¹, A. González¹, A. Villegas¹, A. Rodríguez-Vázquez¹². ¹ AnaFocus e2v, Spain; ² Inst. of Microelectronics of Seville (Univ. de Sevilla & CSIC), Spain

09:35-09:50  12-bit Column-Parallel Single-Slope ADCs with Operation-Period-Reduced Time-to-Digital Converters for CMOS Image Sensors
R46  Yoshio Hagihara, Yusaku Koyama, Susumu Yamazaki, Takanori Tanaka, Atsuko Kume, Yosuke Kusano, Mai Arita, Masashi Saito, and Yoshihisa Okada. Olympus Corporation, Japan

09:50-10:15  Break

Session 10  Invited Presentation and Specialty Image Sensors
Session chair: Edoardo Charbon (Delft Univ. of Technology)
Pierre Magnan (ISAE)

10:15-10:45  Invited Presentation-III
I3  8K imaging systems and their medical applications
Kenkichi Tanioka (Medical Imaging Consortium)

10:45-11:00  UV/Optical Photon Counting and Large Format Imaging Detectors from CubeSats, SmallSats to Ultra-large Aperture Space Telescopes & Imaging Spectrometers
R47  Shouleh Nikzad, John J. Hennessy, April D. Jewel, Alex G. Carver, Michael E. Hoenk, Timothy M. Goodsell, Sam Cheng, Erika Hamden, and Todd J. Jones. Jet Propulsion Laboratory, California Institute of Technology, USA
11:00-11:15 Primal-Dual-Coding CMOS Image Sensor Architecture
R48 Navid Sarhangnejad, Hyunjoong Lee, Nikola Katic, Kyros Kutulakos, Roman Genov. University of Toronto, Canada

11:15-11:30 A 1ms High-Speed Vision Chip with 3D-Stacked 140GOPS Column-Parallel PEs for Diverse Sensing Applications
R49 Atsushi Nose¹, Tomohiro Yamazaki¹, Hironobu Katayama¹, Shuji Uehara¹, Masatsugu Kobayashi¹, Sayaka Shida¹, Masaki Odahara², Kenichi Takamiya², Yasuaki Hisamatsu², Shizunori Matsumoto², Leo Miyashita³, Yoshihiro Watanabe³, Takashi Izawa¹, Yoshinori Muramatsu¹, Yoshikazu Nitta¹, Masatoshi Ishikawa³. ¹Sony Semiconductor Solutions, Japan; ²Sony LSI Design, Japan; ³The University of Tokyo, Japan

11:30-11:45 High Speed Backside Illuminated TDI CCD-in-CMOS Sensor
R50 Pierre Boulenc¹, Jo Robbelein¹, Linkun Wu¹², Vasyl Motsnyi¹, Luc Haspeslagh¹, Stefano Guerrieri¹, Jonathan Borremans¹, Maarten Rosmeulen¹. ¹imec, Belgium; ²Vrije Universiteit Brussel, Belgium

12:30- Lunch / Social Event
18:30- Dinner / Award Session

Friday, June 2nd 2017

Session 11 Invited Presentation and Non-Visible Imaging
Session chair: Shouleh Nikzad (Jet Propulsion Laboratory)
Vyshnavi Suntharalingam (MIT)

08:30-09:00 Invited Presentation-IV
I4 Current status of CCDs for astronomical observations and the development of a large mosaic camera
Satoshi Miyazaki (The National Astronomical Observatory of Japan)

09:00-09:15 Event-Driven Dual-Gain Fully-Depleted SOI Based X-Ray Detector for High Energy Particle Imaging
R51 Sumeet Shrestha¹, Hiroki Kamehama¹, Keita Yasutomi¹, Keiichiro Kagawa¹, Nobukazu Teranishi¹, Ayaki Takeda², Takeshi Go Tsuru², Yasuo Arai³ and Shoji Kawahito¹. ¹Shizuoka University, Japan; ²Kyoto University, Japan; ³High Energy Accelerator Research Organization (KEK), Japan

09:15-09:30 Radiation-hard, Nanosecond-gated CMOS Imaging Detectors
R52 Michael E. Hoenk¹, April D. Jewell¹, Shouleh Nikzad¹, Doug Trotter², Quinn Looker², Gideon Robertson². ¹Jet Propulsion Laboratory, California Institute of Technology, USA; ²Sandia National Laboratories, USA
09:30-09:45  A QuantumFilm Based QuadVGA 1.5µm Pixel Image Sensor with Over 40% QE at 940 nm for Active Illumination Applications.

R53  Nikolai Bock, Aurelien Bouvier, Dario Clocchiatti, Naveen Kolli, Vitanshu Sharma, Emanuele Mandelli. InVisage Technologies, USA

09:45-10:00  Monolithic Near Infrared Image Sensors Enabled by Quantum Dot Photodetector

R54  Pawel E. Malinowski, Epimitheas Georgitzikis, Jorick Maes, Mehedi Mamun, Oscar Enzing, Fortunato Frazzica, Jan Van Olmen, Piet De Moor, Paul Heremans, Zeger Hens, and David Cheyns. 1 IMEC, Belgium; 2 KU Leuven, Belgium; 3 Physics and Chemistry of Nanostructures, Ghent University, Belgium; 4 Center for Nano- and Biophotonics, Ghent University, Belgium; 5 Vrije Universiteit Brussel, Belgium

10:00-10:15  Challenges in Improving the Performances of Radiation Hard CMOS Image Sensors for Gigarad (Grad) Total Ionizing Dose

R55  Vincent Goiffon, Serena Rizzolo, Franck Corbière, Sébastien Rolando, Aziouz Chabane, Marius Sargent, Philippe Paillet, Sylvain Girard, Magali Estribeau, Pierre Magnan, Marco Van Uffelen, Laura Mont Casellas, Marc Gaillardin, Robin Scott and Wouter De Cock. 1 ISAE-SUPAERO, France; 2 CEA, France; 3 Université de Saint-Etienne, France; 4 Fusion for Energy, Spain; 5 Oxford Technologies Ltd., UK; 6 SCK-CEN, Belgium

10:15-10:40  Break

Session 12  Global Shutter

Session chair: Eric Stevens (ON Semiconductor)
Daniel Van Blerkom (Forza Silicon)

10:40-10:55  Cross Talk, Quantum Efficiency and Parasitic Light Sensitivity Comparison for Different Near Infra-Red Enhanced Sub 3um Global Shutter Pixel Architectures

R56  Assaf Lahav, Dmitry Veinger, Adi Birman, Masakatsu Suzuki, Tatsuya Hirata, Keishi Tachikawa, Masafumi Tsutsui, Toshifumi Yokoyama, Yoshiaki Nishi and Ikuo Mizuno. 1 TowerJazz SemiConductors, Israel; 2 Towerjazz Panasonic semiconductor Co,. Ltd., Japan

10:55-11:10  A High Optical Performance 3.4µm Pixel Global Shutter CMOS Image Sensor with Light Guide Structure

R57  Hiroshi Sekine, Masahiro Kobayashi, Yusuke Onuki, Kazunari Kawabata, Toshiki Tsutboi, Yasushi Matsuno, Hidekazu Takahashi, Shunsuke Inoue, and Takeshi Ichikawa. Canon Inc., Japan

11:10-11:25  Design of Double Micro Lens Structure for 2.8um Global Shutter Pixel

R58  Toshifumi Yokoyama, Masakatsu Suzuki, Yoshiaki Nishi, Ikuo Mizuno and Assaf Lahav. 1 Towerjazz Panasonic semiconductor Co,. Ltd., Japan; 2 TowerJazz SemiConductors, Israel
11:25-11:40  A Fully-Depleted 52 μm GS CIS Pixel with 6 ns Charge Transfer, 7 e- rms Read Noise, 80 μV/e- CG and >80 % VIS-QE

Andreas Suss1, Linkun Wu2, Jean-Luc Bacq1, Annachiara Spagnolo1, Philippe Coppejans1, Vasyl Motsnyi1, Luc Haspeslagh1, Jonathan Borremans1, Maarten Rosmeulen1. 1IMEC, Belgium; 2 Vrije Universiteit Brussel, Belgium


David Price1, Rick Jerome1, Akihiro Hasegawa1, Jeff Gambino1, Rusty Winzenread2, Kyle Thomas2, Andrew Piner2, Michael Wu2, Patti Guidash3, Tom Carducci3, Tom Frank3, Bill Desjardin3, Rich Brolly3, Thad Smith4, Brandon Riebeek4, Eddie Glines4, Gerald Heim5, Tom Ebben5, Rino Marinelli6, Onorato Di Cola6, Giovanni De Amicis6. 1 ON Semiconductor, OR, USA; 2 ON Semiconductor, CA, USA; 3 ON Semiconductor, NY, USA; 4 ON Semiconductor, ID, USA; 5 Ball Aerospace, USA; 6 LFoundry, Italy

11:55-12:10  A 47 MPixel 36.4 x 27.6 mm2 30 fps Global Shutter Image Sensor

Guy Meynants, Bram Wolfs, Peishuo Li, Zhisheng Li, Yongjia Li, Ybe Creten, Koen Ruythooren, Raf Lafaille, Pieter De Wit, Pascale Francis, Gerd Beeckman, Jan Martin Kopfer, Jan Bogaerts. AMS, Belgium

12:10-12:15  Closing Remarks