2021 INTERNATIONAL IMAGE SENSOR WORKSHOP

Online event

Sept 20-23, 2021

Paper publication date: Sept 13th, 2021

PROGRAM

Monday, Sept 20th 2021	
15:00	**Opening**
Session 01	**Small Pixels** Session chair: TBA
15:12 R01	The-State-of-the-Art of CMOS Image Sensors *Ziad Shukri, TechInsights Inc., Ottawa, Canada*
15:18 R02	A 40/22nm 200MP Stacked CMOS Image Sensor with 0.61um Pixel *Masayuki Uchiyama[2], Geunsook Park[1]; Tomoyasu Tate[1], Masashi Minagawa[2], Shino Shimoyamada[2], Zhiqiang Lin[1], King Yeung[1], Lien Tu[1], Wu-Zang Yang[3], Alan Hsiung[1], Vincent Venezia[1], Lindsay Grant[1]* *[1] OmniVision Technologies, Santa Clara, CA, USA* *[2] OmniVision Technologies Japan, Kanagawa, Japan* *[3] OmniVision Technologies Taiwan, Hsinchu, Taiwan*
15:24 R03	0.64µm-pitch CMOS Image Sensor with Low Leakage Current of Vertical Transfer Gate *Dongmo Im, Jameyung Kim, Juhee Lee, Sungbong Park, Kwansik Cho, Hyunchul Kim, Chang-Rok Moon and Hyoung-Sub Kim* *Semiconductor R&D Center, Samsung Electronics Co., Republic of Korea.*
15:30 R04	An application of sub-half-micron pixel with preserved color pixel concept for next-generation color image acquisition *Yuichiro Yamashita[1], Yuichiro Yamashita[1], Rihito Kuroda[2,3], Shigetoshi Sugawa[3], Dun Nian Yaung[1]* *[1] CMOS Image Sensor Division, Taiwan Semiconductor Manufacturing Company, Hsinchu, Taiwan, R.O.C.* *[2] Graduate School of Engineering, Tohoku University, Sendai, Japan,* *[3] New Industry Creation Hatchery Center, Tohoku University, Sendai, Japan*
15:36 R05	A study on modulation transfer function and signal-to-noise ratio for Tetracell CMOS image sensors with sub-micrometer scale unit pixels *Jae Ho Kim, Euiyoung Song, Kwanghee Lee, Bumsuk Kim, DaeKwan Kim,Uihui Kwon, Dae Sin Kim* *Samsung Electronics, Hwaseong, Korea,*
15:42 R06	Performance Analysis of Two Low-Noise 0.8um Pixel Designs *Leo Anzaigra, Jiaju Ma, Donald Hondongwa, Dexue Zhang, Saleh Masoodian* *Gigajot Technology Inc, 3452 E Foothill Blvd, Suite 360, Pasadena , CA 91107*
15:48 R07	Novel non metallic pixel isolation technology for high sensitivity in CMOS image sensors with submicron pixels *Hye Yeon Park[1], Yunki Lee[1], In-Sung Joe[2], Boseong Kim[1], Taehan Kim[1], Jeongmin Bae[1], Hyunseok Song[1], Kwangmin Lee[2], Minsung Heo[2], Jinhyung Kim[2], Jaehak Lee[3], Jungho Park[3], Hyunchul Kim[2], Chang-Rok Moon[2], Bumsuk Kim[1], JungChak Ahn[1], Duckhyun Chang[1]* *[1] System LSI Division, Samsung Electronics Co., Ltd* *[2] Samsung Electronics, Semiconductor R&D Center* *[3] Foundry Division, Samsung Electronics Co., Ltd, Korea,*
15:54	**Break**

Session 02	**Low Noise and Photon Counting** Session chair: TBA
16:00 R08	Time Domain Noise Analysis of Oversampled CMOS Image Sensors *Boyd Fowler, Andreas Suess, Mathias Wilhelmsen and Liang Zuo* *OmniVision Technologies, Santa Clara, CA, USA*
16:06 R09	Multi-Gate Source-Follower for Quanta Image Sensors (QIS) *Wei Deng and Eric R. Fossum* *Thayer School of Engineering, Dartmouth College, NH, USA*
16:12 R10	Characterization of Random Telegraph Noises of MOSFET Subthreshold Currents for a 40nm Process *Calvin Yi-Ping Chao, Meng-Hsu Wu, Shang-Fu Yeh, Chi-Lin Lee, Yin Chin, Kuo-Yu Chou, and Honyih Tu* *Taiwan Semiconductor Manufacturing Company, Hsinchu, Taiwan, ROC*
16:18 R11	A 124dB Dynamic-Range SPAD Photon Counting Image Sensor Using Subframe Extrapolation *Jun Ogi, Takafumi Takatsuka, Kazuki Hizu, Yutaka Inaoka, Hongbo Zhu, Yasuhisa Tochigi, Yoshiaki Tashiro, Fumiaki Sano, Yusuke Murakawa†, Makoto Nakamura†, Yusuke Oike* *Sony Semiconductor Solutions, †Sony Semiconductor Manufacturing*
16:24 R12	Quanta Burst Photography *Sizhuo Ma[1], Shantanu Gupta[1], Arin C. Ulku[2], Claudio Bruschini[2], Edoardo Charbon[2], Mohit Gupta[1]* *[1] University of Wisconsin-Madison, USA* *[2] EPFL, Switzerland*
16:30 R13	A 1-Transistor SPAD Quanta Image Sensor for High-Speed and Small-Pitch Arrays *M. Perenzoni, L. Parmesan, F. Acerbi* *Fondazione Bruno Kessler – Sensors and Devices, Trento, Italy*
16:36 R14	A Simple Monte Carlo Transport and Multiplication Simulation Method for the Analysis of a SPAD with a Spherically Uniform Electric Field Peak *Edward Van Sieleghem[1,2], Andreas Süss[2,3], Gauri Karve[2], Koen De Munck2, Chris Van Hoof[1,2], Jiwon Lee[2]* *[1] KU Leuven, ESAT, Kasteelpark Arenberg 10, 3001 Leuven, Belgium* *[2] Imec, Kapeldreef 75, 3001 Leuven, Belgium* *3 now at OmniVision Technologies, Santa Clara CA 95054, USA*
16:42	**Break**
Session 03	**Time-of-Flight** Session chair: TBA
16:48 R15	A Reconfigurable QVGA/Q3VGA Direct Time-of-Flight 3D Imaging System with On-chip Depth-map Computation in 45/40nm 3D-stacked BSI SPAD CMOS *David Stoppa[1], Sargis Abovyan[2], Daniel Furrer[1], Radoslaw Gancarz[1], Thomas Jessenig[2], Robert Kappel[2], Manfred Lueger[2], Christian Mautner[2], Ian Mills[1], Daniele Perenzoni[1], Georg Roehrer[2], Pierre-Yves Taloud[1]* *[1] ams International AG, Eggstrasse 91, 8803 Rueschlikon, Switzerland* *[2] ams AG, Tobelbader Strasse 30, 8141 Premstaetten, Austria*

16:54 R16 Demodulation Contrast simulation for indirect Time-Of-Flight sensors based on Fast Photo-Diode

G. Mugny[*§], P. Fonteneau[†§], B. Rodrigues-Goncalves[†], J.M. Melo Santos[‡], M. Vignetti[†], C. Tubert[*], A. Crocherie[†], D. Rideau[†], F. Lalanne[†], V. Farys[†] and A. Tournier[†]*

[*] STMicroelectronics, Grenoble, France

[†] STMicroelectronics, Crolles, France

[‡] STMicroelectronics, Edinburgh, Scotland, UK

17:00 R17 A 3-Tap Global Shutter 5.0um Pixel with Background Canceling for 165MHz Modulated Pulsed Indirect Time-of-Flight Image Sensor

Masafumi Tsutsui[1], Toshifumi Yokoyama[1], Takahisa Ogawa[1], Ikuo Mizuno[1], Nobuyoshi Takahashi[1], C. Ma[2], F. Wang[3], J. Debondt[4], J. Bogaerts[4], X. Wang[2] & Assaf Lahav[5]

[1] Tower Partners Semiconductor Co. Ltd., Toyama, Japan

[2] Gpixel INC, Changchun, China

[3] Orbbec Shenzhen, Shenzhen, China

[4] Gpixel NV, Antwerp, Belgium

[5] Tower Semiconductor, Migdal Haemek, Israel

17:06 R18 A 4-tap Lock-in Pixel Time-of-Flight Range Imager with Substrate Biasing and Double-Delta Correlated Multiple Sampling

Keita Yasutomi, Michihiro Inoue, Shohei Daikoku, Mars Kamel, Shoji Kawahito

Research Institute of Electronics, Shizuoka University, Hamamatsu, 432-8011, Japan

17:12 R19 CMOS 3D-Stacked FSI Multi-Channel Digital SiPM for Time-of-Flight Vision Applications

Francesco Gramuglia[1], Andrada Muntean[1], Esteban Venialgo[1], Myung-Jae Lee[1], Scott Lindner[1], Makoto Motoyoshi[2], Andrei Ardelean[1], Claudio Bruschini[1], Edoardo Charbon[1]

[1] EPFL, Neuchâtel, Switzerland

[2] T-Micro, Sendai, Japan

17:18 R20 An Ultra-low current operating 5-um Vertical Field Modulator Pixel for in-direct Time of Flight 3D Sensor

Jaehyung Jang[1], Hoonmoo Choi[1], Hyungjune Yoon[1], Jongchae Kim[1], Jongeun Kim[1], Dongjin Lee[1], Jaewon Lee[1], Ohjun Kwon[1], Jungen Song[1], Minseok Shin[1], Kangbong Seo[1]

[1] SK hynix, Future Innovation Technology Group, Icheon-si, Gyeonggi-do, Korea

17:24 R21 Wiggling error self-calibration for indirect ToF image sensors

Min-Sun Keel, Daeyun Kim, Jiheon Park, Sooho Son, Bumsik Chung, Jonghan Ahn, Yeomyung Kim, Myunghan Bae, Hoyong Lee, Myoungoh Ki, Myeonggyun Kye, Il-Pyeong Hwang, Seung-Chul Shin, Young-Gu Jin, Youngsun Oh, Yitae Kim, Jesuk Lee and Duckhyun Chang

Samsung Electronics, Hwaseong, Korea

17:30 Networking Lounge

Tuesday, Sept 21st 2021	
15:00	Opening remarks and announcements
Session 04	**Circuit Design of Pixels and Readout Circuits** Session chair: TBA
15:06 R22	A Partial-Multi-Conversion Single-Slope ADC with Response-Linearized RDAC *Akira Matsuzawa, Abdel Martinez Alonso, Lilan Yu, Minhyuk Sung, Masaya Miyahara* *Tech Idea Co., Ltd., Tamaku, Kawasaki, 214-0021, Japan*
15:12 R23	A 200kFPS, 256×128 SPAD dToF sensor with peak tracking and smart readout *Istvan Gyongy[1], Ahmet T. Erdogan[1], Neale A.W. Dutton[2], Hanning Mai[1], Francesco Mattioli Della Rocca [1], Robert K. Henderson[1]* *[1] The University of Edinburgh, Institute for Integrated Micro and Nano Systems, Edinburgh, U.K., [2] Imaging Division, STMicroelectronics, Edinburgh, U.K.*
15:18 R24	A 13'000 FPS Vision System-on-Chip with Mixed-Signal Compressed Sensing *Jens Döge, Christoph Hoppe, Peter Reichel, Nico Peter, Andreas Reichel and Christian Skubich* *Fraunhofer Institute for Integrated Circuits IIS / EAS, Dresden, Germany*
15:24 R25	Unraveling the paradox of intensity-dependent DVS pixel noise *Rui Graca, Tobi Delbruck* *Sensors Group, Inst. of Neuroinformatics, UZH-ETH Zurich, Zurich, Switzerland*
15:30 R26	Energy Harvesting 3D Stacked Image Sensor with Integrated Data Compression *Filip Kaklin[1,2], Jeffrey M. Raynor[2], Robert K. Henderson[1]* *[1] School of Engineering, Institute for Integrated Micro and Nano Systems, University of Edinburgh, Edinburgh, UK,* *[2]STMicroelectronics Imaging Division, Edinburgh, UK*
15:36 I1	**Invited Presentation I** Sensor Design Parameters Affecting Automotive Machine Vision *Gabriel Bowers, Mobileye, Israel*

Session 05	**Flash Paper Breakout Rooms - session 1** 16:00 – 17:30
P01	Continuous Triple Log Gaussian Dark Current in 3-Tap Indirect ToF Sensors *Takahiro Akutsu, Masanori Nagase and Takashi Watanabe* *Brookman Technology, Inc., Hamamatsu, Japan*
P02	Dark Current Model for the Time of Low Noise & Photon Counting *Dan McGrath* *GOODiX Technology, , Lexington, MA, USA*
P03	Two-photon absorption in CMOS image sensors *Daan Blommaert[1], Guy Meynants[1], and Stefano Guerrieri[2]* *[1] Dept. Electrical Engineering (ESAT), KU Leuven, Belgium* *[2] ams Sensors Belgium, Antwerp, Belgium*
P04	A 5Mpix 5 um 140 fps MWIR Focal Plane Array and Readout Integrated Circuit at 150K *C.G. Jakobson, N. Ben Ari, W. Freiman, N. Shiloah, G. Zohar, T. Argov, O. Cohen, R. Dobromislin, R. Talmor, O. Magen, L. Shkedy, B. Milgrom, T. Markovitz, I. Shtrichman* *Semiconductor Devices, Haifa, Israel*
P05	Study on the Characteristics of Strain according to the dark effect in 1.12u Pixel *Hoyoung Kwak[1], Jongeun Kim[1], Seongil Kim[2], Kangbong Seo[1]* *[1] SK hynix, Future Innovation Technology Group, Icheon-si, Gyeonggi-do, Korea* *[2] SK hynix, AT Group, Cheongju-si, Chungcheongbuk-do, Korea*

P06 Impact of Kickback Noise of Comparator in Single Slope ADC on Photon Transfer Curve Characterization
Shang-Fu Yeh, Meng-Hsu Wu, Chih-Lin Lee, Chin Yin, Kuo-Yu Chou, Hon-Yih Tu, Calvin Yi-Ping Chao Taiwan Semiconductor Manufacturing Company, Hsinchu, Taiwan

P07 Low-noise and high-performance 3-D pixel transistor for sub-micron CMOS image sensors applications
Sung-in Kim, Sungbong Park, Jongeun Park, Hyunchul Kim, Chang-Rok Moon and Hyoung- Sub Kim
Semiconductor R&D Center, Samsung Electronics Co., Republic of Korea

P08 Towards a High-Speed Photon-Counting CMOS Quanta Image Sensor (QIS)
Wei Deng and Eric R. Fossum
Thayer School of Engineering, Dartmouth College, Hanover, NH, USA

P09 Modeling, Characterization and Simulation of Dielectric Absorption in Capacitors in Image Sensors
Manuel Innocent
ON Semiconductor, Mechelen, Belgium

P10 Improvement of Fluorine to Photo Response Non-Uniformity and Random Telegraph Signal of Pinned Photodiodes
Wen-Cheng Yen, Han-Chi Liu, and Sen-Huang Huang
PixArt Imaging Inc., Hsinchu, Taiwan, ROC

P11 Plasmonic diffraction for the sensitivity enhancement of silicon image sensor
Atsushi Ono[1,2], Kazuma Hashimoto[1], and Nobukazu Teranishi[2,3]
1 Graduate School of Integrated Science and Technology, Shizuoka University, Hamamatsu Japan
[2] Research Institute of Electronics, Shizuoka University, Hamamatsu, Japan
[3] Laboratory of Advanced Science and Technology for Industry, University of Hyogo, Hyogo Japan

P12 Indirect-ToF system optimization for sensing range enhancement with patterned light source and optimal binning
Seung-chul Shin, Myeonggyun Kye, Il-pyeong Hwang, Taemin An, Kyu-Min Kyung, Duhyeon Kwak, Hakbeom Jang, Hogyun Kim, Jaeil An, Sunhwa Lee, Yundong Chang, Seongwon Jo, Junghwan Yoo, Myoungoh Ki, Min-Sun Keel, Yitae Kim, Jesuk Lee and Duckhyun Chang
Samsung Electronics, Hwaseong, Korea

P13 A hardware and simulation-based framework for design of SPAD receivers in scanning LiDAR systems
Sarrah M. Patanwala[1, 2], Hanning Mai[1], Alistair Gorman[1], Andreas Aßmann[2], Istvan Gyongy[1], Neale A. W. Dutton[2], Bruce R. Rae[2], and Robert K. Henderson[1]
[1] School of Engineering, Institute for Integrated Micro and Nano Systems, University of Edinburgh, UK, [2]STMicroelectronics Imaging Division, Edinburgh, UK

P14 Planar microlenses applied to SPAD pixels
L. Dilhan[1,2], J. Vaillant[2], Q. Abadie[2], A. Ostrovsky[1], S. Verdet[2], P. Calka[2], F. Hemeret[2], L. Masarotto[2]
[1] STMicroelectronics, Crolles; France,
[2] Univ. Grenoble Alpes, CEA, LETI, Grenoble, France

P15 Innovating CMOS pixel potentials and Full Well Capacity extraction methods from test structures.
C.Doyen[1,2], S.Ricq[1], O.Marcelot[2], P.Magnan[2]
[1] STMicroelectronics, Crolles, France
[2] ISAE-SUPAERO, Université de Toulouse, Toulouse, France

P16 A 1.3M Pixel 34,700fps Global-Shutter BSI Imager with HDR and Motion Blur Suppression Capability

Gaozhan Cai[1], Arno Van Hoorebeeck[1], Bert Luyssaert[1], Bart Dierickx[1], Canol Gokel[1], Tom Van Uffelen[1], Periklis Stampoglis[1], Gerlinde Ruttens[1], Jun Yamane[2], Kenji Tajima[2], Idaku Ishii[3]

[1] Caeleste CVBA, Mechelen, Belgium

[2] Photron Limited, Tokyo, Japan

[3] Hiroshima University, Department of System Cybernetics, Hiroshima, Japan

Wednesday, Sept 22st 2021

15:00 Opening remarks and announcements

Session 06 **Optical Optimization of Pixels**

Session chair: TBA

15:06 R27 A Smart Dual Pixel Technology for Accurate and All-Directional Auto Focus in CMOS Image Sensors

Kyungho Lee, Eun Sub Shim, Junghyung Pyo, Wooseok Choi, Jungbin Yun, Taesub Jung, Kyungduck Lee, Seyoung Kim, Chanhee Lee, Seungki Baek, Junseok Yang, Jongwon Choi, Bumsuk Kim, Chang-Rok Moon, JungChak Ahn, and Duckhyun Chang

Samsung Electronics Co., Ltd., Hwaseong-city, Gyeonggi-do, Korea

15:12 R28 A Compressed N×N Multi-Pixel Imaging and Cross Phase-Detection AF with N×1RGrB+1×NGb Hetero Multi Pixel Image Sensors

Koichi Fukuda

ICB R&D Center 1, Canon Inc.

Graduate School of Engineering, Tohoku University

15:18 R29 Image sensor with V-shape deflector structures for sensor edge performance improvement

Shin-Hong Kuo, Ta-Yung Ni, Guang-Yu Huang, Huang-Jen Chen, Hui-Min Yang, Hao-Min Chen, Hao-Wei Liu, Yu-Chi Chang, Ching-Chiang Wu, Ken Wu, Hung-Jen Tsai

VisEra Technologies Company, Hsinchu, Taiwan

15:24 R30 Quantum Efficiency and Optical Cross-talk of Pixels with Backside Scattering Technique for Near-Infrared Imaging

Tae-Yon Lee, Seungjae Oh, Taehyoung Kim, Hongki Kim, Jihyun Kwak, Masaru Ishii, Surim Lee, Hyoju Kim, Yoonjay Han, Changhwa Kim, Jaehoon Jeon, Dongseok Cho, Seung Sik Kim, Jonghyun Go, In-Gyu Baek, Hyuksoon Choi, Jaekyu Lee, and Chang-Rok Moon

Semiconductor R&D Center, Samsung Electronics Co.,Ltd., Gyeonggi-do, Korea

15:30 R31 Novel Optical Fingerprint CMOS Image Sensor for Ultra-thin Module

Yunki Lee[1], Jonghoon Park[1], Bumsuk Kim[1], Junsung Park[1], Bomi Kim[1], Taehan Kim[1], Yunji Jung[1] ,Yunchul Han[1], Seungjae Yoo[1], Sungkwan Kim[2], Junetaeg Lee[2], Jesuk Lee[1], Chang-Rok Moon[3], Jungchak Ahn[1], and Duckhyun Chang[1]

[1] Samsung Electronics, System LSI Business, Yongin-si, Gyeonggi-do, Korea.

[2] Samsung Electronics, Foundry Business, Yongin-si, Gyeonggi-do, Korea

[3] Samsung Electronics, Semiconductor R&D Center, Hwasung-si, Gyeonggi-do, Korea.

15:36 R32 1.4mm pixel, 8Mpixel, thick epi image sensor for RGB-IR imaging

Jeongeun Song, Sunyoung Lee, Minseok Shin, Sunguk Seo, Hansang Kim, Jinuk Jeon, Ohjun Kwon, Jaehyung Jang, Kangbong Seo

SK Hynix semiconductor Inc, Ichon city, kyoungki province, 464-8603, Korea

15:42 **Invited Presentation II**

I2 EUV Lithography: driving worldwide innovation using advanced technology
Wim van der Zande, ASML, The Netherlands

Session 07 **Flash Paper Breakout Rooms - Session 2**

16:00 – 17:30

P17 A 10-bit 10x10 25µm-Pixel NIR Camera Using Backside-illuminated Ge-on-Si Detectors and Ultra-low-power Direct-injection ROICs
Steffen Epple[1], Zili Yu[1], Mathias Kaschel[1], Michael Oehme[2], Maurice Warnitzek[2, 1] Joerg Schulze[2], Joachim N. Burghartz[1]
[1] Institut für Mikroelektronik Stuttgart (IMS CHIPS), Stuttgart, Germany
[2] Institut für Halbleitertechnik (IHT), Universität Stuttgart, Stuttgart, Germany

P18 Development of an Advanced NIR Multispectral Technology Camera System with Potential Industrial and Medical Innovative Applications
Hirofumi Sumi[1,2], Hironari Takehara[1], and Jun Ohta[1]
[1] Graduate School of Science and Technology, Nara Institute of Science and Technology (NAIST), Japan
[2] Institute of Industrial Science, The University of Tokyo, Japan

P19 SPAD based Time of Flight Pixel Circuits for Large Scale Arrays
Kasper Buckbee[1,2], Neale Dutton[2], Robert K. Henderson[1]
[1] School of Engineering, Institute for Integrated Micro and Nano Systems, University of Edinburgh, Edinburgh, UK, [2] STMicroelectronics Imaging Division, Edinburgh, UK

P20 A Novel Ultra-High-Speed CMOS Image Sensor Implementation with Variable Spatial and Temporal Resolution using Temporal Pixel Multiplexing
Deividas Krukauskas, Ben Marsh, Iain Sedgwick, Nicola Guerrini, Seddik Benhammadi
CMOS Sensor Design Group, Science and Technology Facilities Council (Now part of UK Research and Innovation), Rutherford Appleton Laboratory, Harwell Science and Innovation Campus, Didcot, Oxfordshire, United Kingdom

P21 Charge Level Control with a Capacitive Trench for Imaging Devices
P.Touron[1], F.Roy[1], P.Magnan[2], C.Virmontois[3] and S.Demiguel[4]
[1] STMicroelectronics, Crolles, France
[2] ISAE-Supaero, Université de Toulouse, Toulouse, France,
[3] CNES, Toulouse, France,
[4] Thales Alenia Space, Cannes, France

P22 A rad-hard, 60µm pixel sensor optimized for the direct detection of electrons
M. Sannino[a], A. Bofill-Petit[a], M. Giulioni[a], A. Mollà Garcia[a], and R. Turchetta[a], G. McMullan[b] and R. Henderson[b], C. Copetti[c], B. Janssen, L Mele[c] and G. van Duinen[c]
[a] IMASENIC Advanced Imaging S.L., Barcelona, Spain
[b] Laboratory of Molecular Biology, Cambridge, UK
[c] ThermoFisher Scientific, Eindhoven, NL

P23 A 1280 x 1024 Backside Illuminated CMOS Image Sensor with 0.75e- noise, 25fps and 180mW Power Consumption
Yang Liu[1,2], Tao Jiang[1], Jing Li[1], Cheng Ma[1], Quan Zhou[1], Xinyang Wang[1]
[1]Gpixel INC, Changchun, China
[2]University of Chinese Academy of Sciences, Beijing, China

P24 Characterization of Random Telegraph Signal Histogram according to Floating Diffusion Potential in CMOS Image Sensor
Dongho Ha, Hyungjun Han, Eun-Khwang Lee, Wonjun Lee, Dong Guk Lee, Gayoung Keum, Sieuoo Kim, Jiye Hwang, Hoon-Sang Oh, Changrock Song
CIS Development Group, SK Hynix Inc., Icheon-si, Gyeonggi-do, Republic of Korea

P25 A Multi-Simultaneous-Gate CMOS Lock-in Pixel Image Sensor for Time-Resolved Near-Infrared Spectroscopy
Lioe De Xing, Yuya Shirakawa, Keita Yasutomi, Keiichiro Kagawa, Shoji Kawahito
Research Institute of Electronics, Shizuoka University

P26 Depth precision in dToF sensors for AR applications
Preethi Padmanabhan, Scott Lindner, Pierre-Yves Taloud, and David Stoppa
ams International AG, Rueschlikon, Switzerland

P27 A Multi-Junction Photodetector with Dual Four Transistor Structure to Detect Visible and Near-infrared Light in One Single Pixel.
Weihan Hu[1] and Albert J. P. Theuwissen[1,2]
[1] Electronic Instrumentation Laboratory, Delft University of Technology, Delft, The Netherlands, [2] Harvest Imaging, Bree, Belgium

P28 On the covariance and variance in the determination of PTC
Peter Centen[1], Jeroen Rotte[2]
[1] PeerImaging consulting, Goirle, The Netherlands
[2] Grass Valley, Breda, The Netherlands

P29 High-ambient, super-resolution depth imaging with a SPAD imager via frame re-alignment
Germán Mora-Martín[1], Abderrahim Halimi[2], Robert K. Henderson[1], Jonathan Leach[2], Istvan Gyongy[1]

[1] The University of Edinburgh, Institute for Integrated Micro and Nano Systems, Edinburgh, U.K.
[2] Heriot-Watt University, Institute of Photonics and Quantum Sciences, Edinburgh, U.K.

P30 Dynamic Crosstalk Analysis for Branching Image Sensors
Nguyen H. Ngo[1], Takayoshi Shimura[2], Taeko Ando[1], Heiji Watanabe[2], Kazuhiro Shimonomura[1], Yoshinari Kamakura[3], Hideki Mutoh[4], T. Goji Etoh[1]
[1] Ritsumeikan University, Kusatsu, Shiga, Japan, [2] Osaka University, Osaka, Japan
[3] Osaka Institute of Technology, Osaka, Japan
[4] Link Research Corporation, Kanagawa, Japan

P31 Threshold Uniformity Improvement in 1b QIS Readout Circuit
Zhaoyang Yin[1,2], Jiaju Ma[2], Saleh Masoodian[2] and Eric R. Fossum[1]
[1]Thayer School of Engineering, Dartmouth College, Hanover, NH, USA
[2]Gigajot Technology, Inc., Pasadena, CA, USA

P32 5.6 µm charge domain global shutter pixel with 85dB shutter efficiency
Guy Meynants[1,2], Martin Waeny[1], Deyan Levski[1], Rostislav Kandilarov[1],Denis Sami[1], Georgi Bochev[1], Manlyun Ha[3], WooSung Choi[3], DongJun Oh[3], SeongJin Kim[3], YongChan Kim[3]
[1] Photolitics, Ruse, Bulgaria
[2] Dept. Electrical Engineering (ESAT), KU Leuven, Belgium
[3] DB Hitek, Korea

Thursday, Sept 23th 2021	
15:00	**Opening remarks and announcements** **Best Flash Presentation Paper Award**
15:06	**Walter Kosonocky Award**
Session 08	**High-Speed Imagers** Session chair: TBA
15:12 R33	An Extremely High-Speed and Low-Power Digital Pixel Sensor with Advanced Sensor Architecture *Myunglae Chu, Min-Woong Seo, Suksan Kim, Hyun-Yong Jung, Jiyoun Song, Sung-Jae Byun, Minkyung Kim, Daehee Bae, Junan Lee, Sung-Yong Kim, Jongyeon Lee, Jonghyun Go, Jae-kyu Lee, Changrok Moon, Hyoung-Sub Kim* *Samsung Electronics, Hwaseong-si, Republic of Korea*
15:18 R34	Toward Super Temporal Resolution by Controlling Horizontal Motions of Electrons *T. Goji Etoh[1,2], Nguyen Hoai Ngo[2], Kazuhiro Shimonomura[2], Taeko Ando[2], Takayoshi Shimura[1], Heiji Watanabe[1], Hideki Mutoh[3], Yoshinari Kamakura[4], Edoardo Charbon[5]* *[1] Osaka University, [2] Ritsumeikan University, [3] Link Research Corp., [4] Osaka Inst. Tech., [5] EPFL*
15:24 R35	A 1000fps High SNR Voltage-domain Global Shutter CMOS Image Sensor with Two-stage LOFIC for In-Situ Fluid Concentration Distribution Measurements *Tetsu Oikawa[1], Rihito Kuroda[1,2], Keigo Takahashi[1], Yoshinobu Shiba[2,3], Yasuyuki Fujihara[1], Hiroya Shike[1], Maasa Murata[1], Chia-Chi Kuo[1], Yhang Ricardo Sipauba Carvalho da Silva[1], Tetsuya Goto[2], Tomoyuki Suwa[2], Tatsuro Morimoto[2], Yasuyuki Shirai[2], Masaaki Nagase[3], Nobukazu Ikeda[3], and Shigetoshi Sugawa[2]* *[1] Graduate School of Engineering, Tohoku University, Sendai, Miyagi, Japan* *[2] New Industry Creation Hatchery Center, Tohoku University, [3] Fujikin Incorporated*
15:30 R36	A 40000fps global shutter image sensor with 26.7ns 12-bit row readout time *A. Xhakoni, A. Fekri, P. Francis, K. Vancauwenbergh, K. Van Esbroeck* *AMS, Antwerp, Belgium*
15:36 R37	High speed 21Mpixel global shutter image sensor *T. Blanchaert[1], B. Ceulemans[1], B. Wolfs[1], W. Cotteleer[1], G. Lepage[1], G. Vanhorebeek[1], E. Markey[1], A. Huysman[1], T. Jiang[2], Y. Li[2], C. Ma[2], J. Bogaerts[1]* *[1] Gpixel NV, Antwerp, Belgium, [2]Gpixel Inc, Changchun, China*
15:42 R38	A 1Mpixel, 80k fps Global Shutter CMOS Image Sensor for High Speed Imaging *Daniel Van Blerkom, Loc Truong, Jeff Rysinski, Radu Corlan*, Karthik Venkatesan, Sam Bagwell, Jonathan Bergey* *Forza Silicon, Pasadena, California, USA* ** Vision Research, Wayne, New Jersey, USA*
15:48 R39	A 2.5um 9.5 Mpixel charge domain global shutter imager with dual columns and 7.1 Gbps per channel outputs for high framerate applications *Jeroen Rotte, Rik Visser, Ruud van Ree, Frank van der Weegen, Klaas Jan Damstra* *Grass Valley, Breda, the Netherlands*
15:54	**Break**
Session 09	**Scientific and Non-Silicon Based Imagers** Session chair: TBA
16:00 R40	Detailed Characterization of SWIR-sensitive Colloidal Quantum Dot Image Sensors *Joo Hyoung Kim[1], Vladimir Pejovic[1,2], Epimitheas Georgitzikis[1], Yunlong Li[1], Pawel E. Malinowski[1], Itai Liebermann[1], David Cheyns[1], Paul Heremans[1,2], and Jiwon Lee[1]* *[1] imec, Leuven, Belgium, [2] KU Leuven, Leuven, Belgium*

16:06 R41 Crystalline Selenium Layer Stacked CMOS Image Sensors with Pixel-Wise 1-bit A/D Converters using Avalanche Multiplication Suitable for Photon Counting
Masahide Goto and Shigeyuki Imura
NHK Science & Technology Research Laboratories, Tokyo, Japan,

16:12 R42 High-precision CMOS Proximity Capacitance Image Sensors with Large-format 12µm and High-resolution 2.8µm Pixels
Yuki Sugama[1], Yoshiaki Watanabe[1], Rihito Kuroda[1,2], Masahiro Yamamoto[1], Tetsuya Goto[2], Toshiro Yasuda[3], Shinichi Murakami[3], Hiroshi Hamori[3], Naoya Kuriyama[4], and Shigetoshi Sugawa[2]
[1] Graduate School of Engineering, Tohoku University,, Sendai, Miyagi, Japan
[2] New Industry Creation Hatchery Center, Tohoku University,
[3] OHT Inc., [4] LAPIS Semiconductor Co. Ltd.

16:18 R43 A 4k by 4k 8000fps large format event-based sparse readout direct electron image sensor
Peng Gao[1], Benjamin Bammes[2], Sampsa Veijalainen[1], Jente Basteleus[1], Gaozhan Cai[1], Bert Luyssaert[1], Bart Dierickx[1], Robert Bilhorn[2]
[1] Caeleste, Mechelen, Belgium, [2] Direct Electron LP, San Diego, CA, USA

16:24 R44 2x2-aperture 4-tap CMOS image sensor for multi-modal multi-band tissue imaging with suppressing the ambient light and motion artifact
Yuto Shimada, Kazuki Takada, Hoang Son Nam, Kakeru Miyazaki, Kohei Watanabe, Iori Shibata, Keita Yasutomi, Shoji Kawahito, Keiichiro Kagawa
Shizuoka University, Japan

16:30 R45 A Time-Resolved 4-tap Image Sensor Using Tapped PN-Junction Diode Demodulation Pixels
Hiroaki Nagae[1], Shohei Daikoku[1], Keita Kondo[1], Keita Yasutomi[1,2], Keiichiro Kagawa[1,2], Shoji Kawahito[1,2]
[1]Graduate School of Integrated Science and Technology, Shizuoka University, Hamamatsu, Japan
[2]Research Institute of Electronics, Shizuoka University, Hamamatsu, Japan

16:36 R46 A 500x500 Dual-Gate SPAD Imager with 100% Temporal Aperture and 1 ns Minimum Gate Width for FLIM and Phasor Imaging Applications
Arin Can Ulku, Andrei Ardelean, Paul Mos, Claudio Bruschini, Edoardo Charbon
AQUA Laboratory, Ecole polytechnique fédérale de Lausanne (EPFL)

16:42 Break

Session 10	**Global Shutter and High Dynamic Range Imagers**
	Session chair: TBA

16:48 R47 A 4.0µm Stacked Digital Pixel Sensor Operating in A Dual Quantization Mode for Over 120dB Dynamic Range
Kazuya Mori[1],Naoto Yasuda[1],Toshiyuki Isozaki[1], Ken Miyauchi[1], Isao Takayanagi[1], Junichi Nakamura[1], H.C.Chen[2], Ken Fu[2],SG.Wuu[2], Andrew Berkovich[3], Song Chen[3], Wei Gao[3] and Chiao Liu[3]
[1] Brillnics Japan Inc., Tokyo, Japan
[2] Brillnics Inc., Hsinchu, Taiwan
[3] Facebook Reality Labs, Facebook Inc, Menlo Park, CA, USA

16:54 R48 Automotive 3 µm HDR Image Sensor with LFM and Distance Functionality
Sergey Velichko, Michael Guidash, Daniel Tekleab, Hung-Chih Chang, Manuel Innocent, Steve Nicholes, Denver Lloyd, Dave Jasinski, Andrew Perkins, Shaheen Amanullah, Maheedhar Suryadevara, Chris Silsby, Jeff Beck
Intelligent Sensing Group, ON Semiconductor, USA

17:00 R49 — 4.0µm Stacked Voltage Mode Global Shutter Pixels with A BSI LOFIC and A PDAF Capability
Ken Miyauchi†, Kazuya Mori†, Toshiyuki Isozaki†, Yusuke Sawai†, Ho-Ching Chien‡ and Junichi Nakamura†
†Brillnics Japan Inc., Tokyo, Japan
‡Brillnics Inc., Hsinchu, Taiwan

17:06 R50 — A 12Mpixel 1.3" optical format CMOS HDR image sensor achieving single-exposure flicker-free 90dB Dynamic range in GS shutter mode and 110dB Dynamic Range in 2-exposure ERS mode
Parthasarathy Sampath[+], Genis Chapinal, Gurvinder Singh, Miten Odharia, Manuel Innocent, Tomas Geurts, Anirudh Oberoi, Rick Mauritzson, Chris Parks, John McCarten, Cristian Tivarus, Hung Doan, Neeraj Chouhan, Shreesha Gopalakrishna, Dan Pates, Igor Butinar, Rajashekar Benjaram*
[+]ON Semiconductor, Bangalore, India
*ON Semiconductor, Mechelen, Belgium

17:12 R51 — A 5.6µm Stacked Voltage Domain Global Shutter Pixel with 70ke- Linear Full Well Capacity and 85dB Single Exposure High Dynamic Range
Yusuke Sawai†, Toshiyuki Isozaki† , Naoto Yasuda†, Ken Miyauchi†, Ken Fu‡ and Kazuya Mori† †Brillnics Japan Inc., Tokyo, Japan ‡Brillnics Inc., Hsinchu, Taiwan

17:18 R52 — A Double Transfer 8.0µm Pixel with High Conversion Gain and Pixel Binning
Ikuo Mizuno[1], Masafumi Tsutsui[1], Masayuki Nakamura[1], Dmitri Ivanov[2], Dmitry Veigner[2] & Assaf Lahav[2]
[1] Tower Partners Semiconductor Co., Ltd., Toyama, Japan
[2] Tower Semiconductor Migdal Haemeq 23105, Israel

17:24 — **Best Student Paper Award**

Closing remarks