

# ISSW 2022 **Workshop Program**

The International SPAD Sensor Workshop · June 13 - 15, 2022

CEST

## Monday, June 13

08:15 – 08:30

### Welcome and Introduction

David Stoppa, Sony Europe B.V. and Verena Vescoli, ams OSRAM  
(Speaker Local Time CEST)

### Session 1: SPAD Technologies

Session Chair: Sara Pellegrini, STMicroelectronics  
Session Co-Chair: Robert Henderson, University of Edinburgh

08:30 – 09:00

### Scalable Backside-Illuminated Charge-Focusing Silicon SPADs with Enhanced Near-Infrared Sensitivity

Edward Van Sieleghem, IMEC (Speaker Local Time CEST)

09:00 – 09:30

### A Back Side Illuminated 3D-Stacked SPAD in 45nm Technology

Georg Roehrer, ams OSRAM (Speaker Local Time CEST)

09:30 – 10:00

### New SPAD dspc – Third Generation

Daniel Gäbler, X-FAB Silicon Foundries (Speaker Local Time CEST)

10:00 – 10:30

### Back-Illuminated SPADs in Stacked 40nm CIS Technology

Myung-Jae Lee, Korea Institute of Science and Technology (Speaker Local Time CEST +7h)

10:30 – 10:45

### Break

10:45 – 11:15

### A Challenge for 3µm SPAD Pixel Using Embedded Metal Contact on Deep Trench Pixel Isolation

Jun Ogi, Sony Semiconductors Solutions Corporation (Speaker Local Time CEST +7h)

11:15 – 11:45

### Multi-Megapixel 3D-Stacked Charge Focusing SPAD Image Sensors

Kazu Morimoto, Canon (Speaker Local Time CEST +7h)

11:45 – 12:15

### Sherbrooke Frontside Illuminated SPAD Architecture and Preliminary Performances

Jean-François Pratte, Université de Sherbrooke (Speaker Local Time CEST -6h)

12:15 – 13:05

### Lunch and Sponsor Talks

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### Sponsor Talks

Session Chair: David Stoppa, Sony Europe BV

12:15 – 12:40

#### **SPAD requirements from consumer electronics to automotive**

Chao Zhang, Shenzhen Adaps Photonics Technology Co., Ltd

12:40 – 13:05

#### **Enabling quantum technologies through photonic sensing solutions**

Martin Felle, ID Quantique

### Session 2: SPAD Technologies and Modeling

Session Chair: Alberto Tosi, Politecnico di Milano

Session Co-Chair: Claudio Bruschini, EPFL

13:05 – 13:35

#### **Characterization and modeling of displacement damage in CMOS SPAD sensors**

Lucio Pancheri, University of Trento (Speaker Local Time CEST)

13:35 – 14:05

#### **Noise Issues of SPADs in Standard Silicon Technologies**

Jamal Deen, McMaster University (Speaker Local Time CEST -6h)

14:05 – 14:35

#### **Making Event-driven and SPAD-based Imagers Converge: A 64x64 110nm CMOS Multi-mode Vision Sensor**

Rubén Gómez Merchán, University of Seville (Speaker Local Time CEST)

14:35 – 15:05

#### **Towards a new generation of SiPMs for the 10ps Time-of-Flight PET challenge**

Paul Lecoq, Multiwave Metacrystal SA, Polytechnic Universit Valencia  
(Speaker Local Time CEST)

15:05 – 15:35

#### **SPAD advanced modeling: From TCAD to SPICE simulation**

Denis Rideau, STMicroelectronics (Speaker Local Time CEST)

15:35 – 15:50

#### **Break**

15:50 – 16:20

#### **A low-power high-dynamic-range SPAD for sustainable sensing**

Sara Pellegrini and Bruce Rae, STMicroelectronics, (Speaker Local Time CEST -1h)

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### Session 3: Computational Imaging

Session Chair: Edoardo Charbon, EPFL

Session Co-Chair: David Stoppa, Sony Europe BV

16:20 – 16:50

#### Computer vision, one photon at a time

Mohit Gupta, University of Wisconsin-Madison (Speaker Local Time CEST -7h)

16:50 – 17:20

#### Quantum imaging with SPAD arrays

Daniele Faccio, University of Glasgow (Speaker Local Time CEST -1h)

17:20 – 17:50

#### Wearable near-infrared, time-domain diffuse optical tomography system for functional brain imaging

Ken Shepard, Columbia University (Speaker Local Time CEST -6h)

17:50 – 19:00

### Poster Session

#### 16x17 SPAD sensor for single-shot single-point LiDAR

Alfonso Incoronato, Politecnico di Milano

#### msSiPM with Analog Cross-Correlation Computation

Arianna Morciano, Fondazione Bruno Kessler

#### Exploiting Multibounce Returns in Time-of-flight Imaging

Connor Henley, Massachusetts Institute of Technology

#### InGaAs/InP SPADs optimized for either low DCR or high PDE

Fabio Telesca, Politecnico di Milano

#### Radiation Hardness Study of SPADs

MingLo Wu, EPFL

#### Passive Inter-Photon Imaging

Trevor Seets, University of Wisconsin-Madison

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### **Single-Photon Structured Light**

Varun Sundar, University of Wisconsin-Madison

### **A Highly Linear Time-of-flight Sensor for Pulse Oximetry**

Yuanyuan Hua, University of Edinburgh

### **Laser Power Limits of SPAD-based Flash Lidar**

Filip Taneski, University of Edinburgh

### **SPAD array for protein sequencing through Raman Spectroscopy**

Arianna Adelaide Maurina, Politecnico di Milano

### **High resolution, long range Time-to-Digital Converter for SPAD arrays**

Chiara Nonne, Politecnico di Milano

### **Electronic Interfaces for Bio-Photonics Data Capture**

Rachel Georgel, Tyndall National Institute

### **Blumino: the first fully integrated analog SiPM**

Andrada Muntean, EPFL

### **Guard-Ring-Free InGaAs/InP SPAD**

Ekin Kizilkan, EPFL

### **1: Compressive SP3DC**

### **2: SPC Guided HDR**

Felipe Gutierrez Barragan, University of Wisconsin-Madison

19:00

Monday workshop close

# ISSW 2022 **Workshop Program**

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**Tuesday, June 14**

**Session 4: Depth Sensing**

Session Chair: Edoardo Charbon, EPFL

Session Co-Chair: David Stoppa, Sony Europe BV

**08:30 – 09:00**

**Precise Distance Measurement with Thick SPADs**

Michael Hofbauer, TU Wien (Speaker Local Time CEST)

**09:00 – 09:30**

**A 64 × 64 SPAD-Based Indirect Time-of-Flight Image Sensor with a depth range of 50m**

Byungchoul Park, Yonsei University (Speaker Local Time CEST +7h)

**09:30 – 10:00**

**SPAD based Spot dToF system**

Yu Qin, Shenzhen Adaps Photonics Technology Co., Ltd (Speaker Local Time CEST +6h)

**10:00 – 10:30**

**Design, fabrication and testing of an >10k pixel BSI CSPAD array**

Christian Walk, Fraunhofer IMS (Speaker Local Time CEST)

**10:30 – 10:45**

**Break**

**10:45 – 11:15**

**Direct time-of-flight imaging with in-pixel peak tracking**

Istvan Gyongy, University of Edinburgh (Speaker Local Time CEST -1h)

**11:15 – 11:45**

**A short pulse high power laser driver for SPAD TOF systems**

Jed Hurwitz, Analog Devices (Speaker Local Time CEST -1h)

**11:45 – 12:15**

**A 1.2K dots direct Time-of-Flight 3D Imaging System with on-chip depth map computation, in 45/22nm 3D-stacked BSI SPAD CMOS**

Pierre-Yves Taloud, ams OSRAM (Speaker Local Time CEST)

**12:15 – 13:05**

**Lunch and Sponsor Talks**

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## **Sponsor Talks**

Session Chair: Claudio Bruschini, EPFL

**12:15 – 12:40**

### **Sense the Wonder**

David Stoppa, Sony Europe BV

**12:40 – 13:05**

### **Tailored optical properties for SPADs within a standard CMOS process**

Alexander Zimmer, X-FAB Silicon Foundries Global Services GmbH

## **Session 4: Depth Sensing**

Session Chair: David Stoppa, Sony Europe BV

Session Co-Chair: Edoardo Charbon, EPFL

**13:05 – 13:35**

### **Fast-gated 16x16 SPAD array with on-chip 6 ps TDCs for non-line-of-sight imaging**

Simone Riccardo, Politecnico di Milano (Speaker Local Time CEST)

**13:35 – 14:05**

### **Models of Direct Time-of-Flight Sensor Precision with Implications for On-Chip Histogram Processing**

Lucas Koerner, University of St. Thomas (Speaker Local Time CEST -7h)

## **Session 5: Quantum Applications**

Session Chair: Robert Henderson, University of Edinburgh

Session Co-Chair: Alberto Tosi, Politecnico di Milano

**14:05 – 14:35**

### **Fast Quantum Ghost imaging with SPADs: from basics to experimental validation with smart sensor architectures**

Massimo Gandola, FBK (Speaker Local Time CEST)

**14:35 – 15:05**

### **Correlation plenoptic imaging based on SPAD technology**

Milena D'Angelo, Università di Bari (Speaker Local Time CEST)

**15:05 – 15:20**

**Break**

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15:20 – 15:50

**EURAMET European Metrology Network for Quantum Technologies: Quantum Metrology and Single Photon Detector calibration**  
Ivo Degiovanni, INRIM (Speaker Local Time CEST)

15:50 – 16:20

**Single Photon Detection for Quantum Communication**  
Hugo Zbinden, University of Geneva (Speaker Local Time CEST)

16:20 – 16:50

**Event-driven SPAD arrays for quantum imaging and microscopy**  
Federica Villa, Politecnico di Milano (Speaker Local Time CEST)

16:50 – 17:20

**Communication and Networking**

17:20 – 18:30

**Poster Session**

**16x17 SPAD sensor for single-shot single-point LiDAR**  
Alfonso Incoronato, Politecnico di Milano

**msSiPM with Analog Cross-Correlation Computation**  
Arianna Morciano, Fondazione Bruno Kessler

**Exploiting Multibounce Returns in Time-of-flight Imaging**  
Connor Henley, Massachusetts Institute of Technology

**InGaAs/InP SPADs optimized for either low DCR or high PDE**  
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**Radiation Hardness Study of SPADs**  
MingLo Wu, EPFL

**Passive Inter-Photon Imaging**  
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## Tuesday, June 14

### **A Highly Linear Time-of-flight Sensor for Pulse Oximetry**

Yuanyuan Hua, University of Edinburgh

### **Laser Power Limits of SPAD-based Flash Lidar**

Filip Taneski, University of Edinburgh

### **SPAD array for protein sequencing through Raman Spectroscopy**

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### **High resolution, long range Time-to-Digital Converter for SPAD arrays**

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### **Electronic Interfaces for Bio-Photonics Data Capture**

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### **Blumino: the first fully integrated analog SiPM**

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### **Guard-Ring-Free InGaAs/InP SPAD**

Ekin Kizilkan, EPFL

### **1: Compressive SP3DC**

### **2: SPC Guided HDR**

Felipe Gutierrez Barragan, University of Wisconsin-Madison

18:30

Tuesday workshop close



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## Wednesday, June 15

### Session 6: Emerging Technologies and Long Wavelength SPADs

Session Chair: Sara Pellegrini, STMicroelectronics

Session Co-Chair: Alberto Tosi, Politecnico di Milano

- 09:00 – 09:30**      **A 7.5-ps, 60% PDP low-noise SPAD fabricated in CMOS technology**  
Francesco Gramuglia, EPFL (Speaker Local Time CEST)
- 09:30 – 10:00**      **Design and Fabrication of Solid-State Photomultiplier (SSPM) composed of multi-pixel InGaAs SPAD**  
Chan-Yong Park, Wooriro Co Ltd (Speaker Local Time CEST +7h)
- 10:00 – 10:30**      **Silicon Photomultipliers in Optical Wireless Communications: Results and Future Prospects**  
Steve Collins, Oxford University (Speaker Local Time CEST -1h)
- 10:30 – 11:00**      **Mid-infrared Single-photon Up-conversion Imaging**  
Heping Zeng, East China Normal University (Speaker Local Time CEST +6h)
- 11:00 – 11:15**      **Break**
- Session 7: Spectroscopy and Sensing**
- Session Chair: Claudio Bruschini, EPFL  
Session Co-Chair: Robert Henderson, University of Edinburgh
- 11:15 – 11:45**      **High-speed, CMOS, full chemical fingerprint Raman spectroscopy sensor utilizing 1536 x 8 SPAD array**  
Jussi-Pekka Jansson, Oulu University (Speaker Local Time CEST +1h)
- 11:45 – 12:15**      **Cranking up the speed in spontaneous Raman imaging with SPAD technology**  
Hilton B. de Aguiar, CNRS/Sorbonne (Speaker Local Time CEST)
- 12:15 – 12:45**      **Heralded spectroscopy with a linear SPAD array spectrometer**  
Dan Oron, Weizmann Institute of Science (Speaker Local Time CEST +1h)
- 12:45 – 13:35**      **Lunch and Sponsor Talks**

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## Wednesday, June 15

### Sponsor Talks

Session Chair: Sara Pellegrini, STMicroelectronics

12:45 – 13:10

### Sensing in a new Light

Verena Vescoli, ams-OSRAM AG

13:10 – 13:35

### Communication and Networking

### Session 7: Spectroscopy and Sensing

Session Chair: Robert Henderson, University of Edinburgh

Session Co-Chair: Claudio Bruschini, EPFL

13:35 – 14:05

### Imaging deep-tissue blood flow via parallelized diffuse correlation spectroscopy

Roarke Horstmeyer, Duke University (Speaker Local Time CEST -6h)

14:05 – 14:35

### Emerging Clinical Applications of Fluorescence Using SPADs

David Birch, Horiba/University of Strathclyde (Speaker Local Time CEST -1h)

14:35 – 15:05

### Deciphering laser speckle statistics of turbid media to measure deep tissue blood flow using single photon counting detectors: clinical applications

Turgut Durduran, ICFO (Speaker Local Time CEST)

15:05 – 15:35

### SPAD Imagers for Subsurface Fluorescence-guided Surgical Navigation

Petr Brůža, Dartmouth Engineering (Speaker Local Time CEST -6h)

15:35 – 16:00

### Workshop closing remarks

16:00

### Workshop close