IEEE

INERTIAL 2021

The 8th IEEE International Symposium on Inertial Sensors & Systems

Virtual Symposium | March 22-25, 2021

INERTIAL 2021 SYMPOSIUM PROGRAM

Please visit website for more information!

https://2021.ieee-inertial.org/

SPONSORS AND ORGANIZERS

IEEE

IEEE Sensors Council

IEEE INERTIAL 2021

The 8th IEEE International Symposium on Inertial Sensors & Systems

Virtual Symposium | March 22-25, 2021

Table of Contents

Welcome Message from the Chairs

Dear Colleagues/Friends,

We warmly welcome you to your desk, couch, or location of choice, to present, exhibit, and participate in the 8th IEEE International Symposium on Inertial Sensors and Systems (INERTIAL'21).

This year's event continues our established tradition, started in 2014 in Laguna Beach, CA, USA of informal international meetings discussing the latest developments in the area of modern inertial sensors and emerging applications enabled by inertial sensors.

The IEEE INERTIAL is sponsored by the IEEE Sensors Council and is the only IEEE event exclusively dedicated to the Inertial Sensors and Systems technology. The adoption and application of this technology is growing fast, with the global inertial sensors and systems market expected to reach $21.7B by next year.

The symposium offers a rare opportunity to meet and network with leaders in the field of inertial sensors and systems in an informal atmosphere of a focused international technical gathering. We hope the atmosphere, breadth and depth of research topics combined with the quality of invited and contributed technical presentations will continue to make the INERTIAL a 'must attend' event for you every year.

The INERTIAL has an ambition to establish itself as the premier forum for reporting the latest research, development, and commercialization results in modern inertial sensors technology. You will hear from the world experts the latest in materials and micro-fabrication processes, innovative designs, new physical principles, increased performance, and a growing number of new applications and business opportunities.

The technical program covers three and a half days of technical presentations. By design, this is a single track symposium with high quality oral presentations and exhibitions. Each presentation was carefully reviewed and selected by our Technical Program Committee, after a careful evaluation by at least three independent reviewers – the technical experts in the field. Our 8 distinguished invited speakers will participate in a number of sessions throughout the meeting. The contributed papers will be presented in oral live or prerecorded videos (33 papers) and all of the speakers will participate in one of the 9 live Q&A/panel discussion sessions. Our program will begin on Monday with four tutorials offered in the areas of (i) MEMS Inertial Sensors, (ii) sensor and system applications, (iii) navigation aiding techniques, and (iv) integrated photonics for optical gyroscopes. The tutorials are organized and chaired by Dr. Jenni Strabley from the Honeywell Corporation.

The Digest of Technical Papers for the 2021 IEEE Inertial Sensors contains up to four-page versions of the standard technical papers and 2-pagers of "late news" presentations, all provided to attendees in an electronic form. Most (but not all) presented papers will be available in the IEEE Xplore after the symposium. Our distinguished exhibitors and patrons will be involved throughout the symposium hosting Q&A sessions and available for live discussions during specific time windows. Please be sure to visit their exhibitor pages and talk with them live during the meeting.

Continuing the long standing IEEE Inertial tradition, the Technical Program Committee will select one Best Student Paper (as well as first and second runner up papers). The Award will be announced on Thursday during two separate and time zone convenient sessions in which we will also announce the location for the 2022 meeting. Good luck to all presenting students!

During this year's virtual meeting we will be conducting an informal zoom virtual background contest. So I encourage everyone to be creative and have some fun with your virtual backgrounds. We will be looking for the most creative, fun, entertaining, or unique backgrounds throughout all the live sessions during the week.

We would like to express our special thanks to the Oversight Committee, the Technical Program Committee, and many experts who contributed their time to evaluate submissions.

We thank the IEEE Sensors Council for sponsoring the 2021 IEEE Inertial Sensors as well as our Patrons and Exhibitors. Our special thanks to Brianna Orr, and the entire staff at Conference Catalysts, LLC for administrative support.

Finally, we thank all speakers, presenters, and attendees for making the 2021 IEEE Inertial Sensors Symposium such a unique event. We hope that you find the INERTIAL'21 Symposium professionally stimulating and enjoyable, and of course, we are looking forward to seeing you back next year for the INERTIAL'22.

Michael Larsen

IEEE INERTIAL 2021 General Chair

IEEE INERTIAL 2021
The 8th IEEE International Symposium on Inertial Sensors & Systems
Virtual Symposium | March 22-25, 2021

IEEE Inertial Sensors & Systems Symposium 2021 Organizers

Symposium Chair:

Michael Larsen, Northrop Grumman, USA

Technical Program Committee Chair:

Ronald Polcawich, DARPA, USA

Oversight Committee:

Andrei Shkel, University of California, Irvine, USA

Giacomo Langfelder, Politecnico di Milano, Italy

Michael Larsen, Northrop Grumman, USA

Ronald Polcawich, DARPA, USA

Shuji Tanaka, Tohoku University, Japan

Treasurer:

Igor Prikhodko, Analog Devices, Inc., USA

Symposium Management:

Conference Catalysts, LLC, United States

Track Chairs:

Dan Endean, Honeywell, USA

Toshiyuki Tsuchiya, Kyoto University, Japan

Olivier Le Traon, ONERA, France

Technical Program Committee:

Mohammed Jalal Ahamed, University of Windsor, Canada

Sina Askari, ECS, USA

Julien Auger, SAFRAN Tech, France

Justin Brown, Physical Sciences, Inc., USA

Michael Bulatowicz, Northrop Grumman, USA

Jenna F. Chan, US Army CCDC-ARL, USA

Joseph Cotter, Imperial College London, United Kingdom

Xiao Dingbang, National University of Defense Technology, China

Alexandra Efimovskaya, Microsoft, USA

Dan Endean, Honeywell, USA

Joan Josep Giner de Haro, Bosch Sensortec, Germany

Brian Grantham, US Army CCDC AvMC, USA

Eric Imhof, Northrop Grumman, USA

Olivier Le Traon, ONERA, France

Giacomo Langfelder, Politecnico di Milano, Italy

Michael Larsen, Northrop Grumman, USA

Doug Meyer, Northrop Grumman, USA

Kari Moran, Navy, SSC Pacific, USA

Radwan M. Noor, KACST, Saudi Arabia

Ronald Polcawich, DARPA, USA

Igor Prikhodko, Analog Devices Inc., USA

Andrei Shkel, University of California, Irvine, USA

Jenni Strabley, Honeywell, USA

Shuji Tanaka, Tohoku University, Japan

Tsuchiya Toshiyuki, Kyoto University, Japan

IEEE INERTIAL 2021
The 8th IEEE International Symposium on Inertial Sensors & Systems
Virtual Symposium | March 22-25, 2021

Technical Reviewers

Jalal Ahamed
Mohammad Asadian
Sina Askari
Julien Auger
Michael Bulatowicz
Jenna Chan
John Close
Caroline Coutier
Frédéric Davi
Jeff DeNatale
Rosana Dias
Andrea Donadel
Daniel Donavanik
Alexandra Efimovskaya
Dan Endean
Ryunosuke Gando
Joan Josep Giner de Haro
Brian Grantham
Jeffrey Gregory
Jean Guerard
Tyler Harrison
Ryan Hennessy
Tracy Hudson
Tamio Ikehashi
Raphael Jarraud
Burgess Johnson
Jérôme Julliard
Yudai Kamada
Imran Khan
Ryan Knight
Ole Kock
Giacomo Langfelder
Olivier Le Traon
Raphael Levy
Vasco Lima
Yu-Wei Lin
Kuo Lu
Jean Sébastien Macé
Daisuke Maeda
Cristiano Rocco Marra
Paolo Minotti
Radwan Mohammednoor
Kari Moran
Eurico Moreira
Saeed Mozaffari
Frank Narducci
Tomas Neuzil
Mikko Partanen
Tommi Piirainen
Ronald Polcawich
Igor Prikhodko
Dusan Radovic
Vincent Ragot
Afshin Rahimi
Payman Rajai
John Reinke
Emmanuel Robert Ryan
Rudy
Andrew Sabater
Frank Schmid
Doruk Senkal
Neal Solmeyer
Logan Sorenson
Kevin Stanzione
Jenni Strabley
Matthew Straeten
Shuji Tanaka
Takashiro Tsukamoto
Philippe Ullah
Daryosh Vatanparvar
Tianren Wang
Danmeng Wang
Dingbang Xiao
Kai Zeng
Rong Zhang
Tianyi Zhao
Sergei Zotov

THANK YOU TO OUR PATRONS

PLATINUM PATRONS

NORTHROP GRUMMAN

STUDENT AWARD PATRONS

NORTHROP GRUMMAN

TOKYO KEIKI

THANK YOU TO OUR PATRONS

GOLD PATRONS

BMF
BOSTON MICRO FABRICATION

C2MI
Reinventing innovation

fiber optical solution

FIBERPRO

FIZOPTIKA

THANK YOU TO OUR PATRONS

SILVER PATRONS

COVENTOR®
A Lam Research Company

Inertial
Sensor
Design

GENERAL PATRONS

OPTOQUEST

SPECIAL THANKS

The conference organizers gratefully acknowledge the generous support provided by the following:

IEEE

IEEE Sensors Council

Technical Program: Monday, March 22

Program is listed in UTC Time.

6:45 AM – 7:00 AM

Opening Remarks

Michael Larsen (Northrop Grumman), **Ron Polcawich** (DARPA)

7:00 AM - 9:30 AM

Tutorial: Integrated navigation solutions for new mobility applications

Domenico Accardo, Università degli Studi di Napoli Federico II, Italy

9:30 AM – 10:00 AM

Break/Open Discussion

10:30 AM – 11:30 AM

Social Hour

11:30 AM - 2:00 PM

Tutorial: Navigation Aiding Techniques

JP Laine, DRAPER, USA

2:00 PM - 4:30 PM

Tutorial: Innovative intelligence in MEMS Inertial Sensors

Chris Kim, STMicroelectronics, USA

4:30 PM – 5:00 PM

Break/Open Discussion

5:00 PM - 7:30 PM

Tutorial: Towards integrated optical gyroscopes

Kerry Vahala, California Institute of Technology, USA

7:30 PM – 8:00 PM

Break/Open Discussion

8:00 PM – 10:30 PM

A1L-A: MEMS Gyroscopes I USA

Session Chair(s): Brian Grantham (DEVCOM AvMC)

8:00 PM

Invited Talk: Platform Technologies for High-Performance Inertial Sensors

Jeff DeNatale, Teledyne Technologies, USA

Technical Program: Monday, March 22 (cont.)

Program is listed in UTC Time.

8:25 PM

Monocrystalline 4H Silicon Carbide-on-Insulator Substrates for Nav-Grade Planar BAW Gyroscopes

Benoit Hamelin, Jeremy Yang, Zhenming Liu, Farrokh Ayazi

Georgia Institute of Technology, United States

8:50 PM

Vibration Immune, Long-Term Stable and Low Noise Synchronized Mass MEMS Gyroscope

Igor Prikhodko{1}, John Geen{1}, Carey Merritt{1}, Sam Zhang{1}

{1}Analog Devices, United States

9:15 PM

Effect of EAM on Quality Factor and Noise in MEMS Vibratory Gyroscopes

Danmeng Wang, Andrei Shkel

University of California, Irvine, United States

9:40 PM

Q&A Panel

10:30 PM – 11:00 PM

Break/Open Discussion

WORLD'S SMALLEST FIBER OPTIC GYROSCOPES

actual size image

fizoptika.com

C2MI

WE ARE ...

A collaborative solution of choice to accelerate the commercialization of components

An international reference in scientific research and commercialization

A great help to produce prototypes dictated by market needs

DEDICATED TO THE RAPID COMMERCIALIZATION OF MICROELECTRONIC PRODUCTS

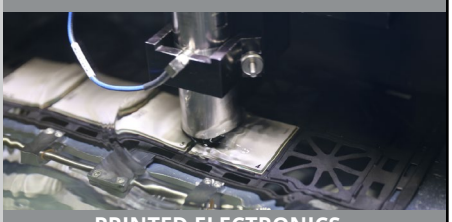
MiQro Innovation Collaborative Centre
45, boulevard de l'Aéroport, Bromont (Qc) Canada |www.c2mi.ca

OUR EXPERTISE

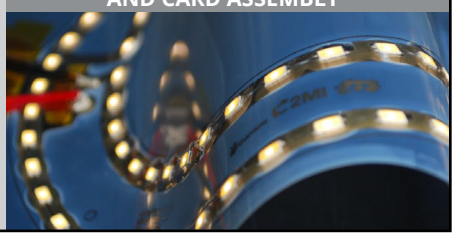
MEMS MANUFACTURING

ADVANCED PACKAGING

ANALYTICAL SERVICES



PRINTED ELECTRONICS AND CARD ASSEMBLY



Monday, March 22 / Tuesday, March 23

Program is listed in UTC Time.

11:00 PM – 1:10 AM

B1L-A: Rate Integrating Gyroscopes - USA / China

Session Chair(s): **Takashiro Tsukamoto** (Tohoku Univesity), **Haoran Wen**

11:00 PM

A High-Performance Rate-Integrating Hemispherical Resonant Gyros with 0.00753°/h Bias Instability

Yongmeng Zhang{1}, Sheng Yu{2}, Kechen Guo{1}, Jiangkun Sun{1}, Xuezhong Wu{1}, Dingbang Xiao{1}

{1}National University of Defense Technology, China; {2}National University of Defense Technology, Hunan MEMS Research Center, China

11:25 PM

Identification of Gain Mismatches in Control Electronics of Rate Integrating CVGs

Daryosh Vatanparvar, Andrei Shkel

University of California, Irvine, United States

11:50 PM

Invited Talk: R&D FOR COMMERCIALIZATION OF MEMS RATE INTEGRATING GYROSCOPE: CHALLENGES AND PRACTICAL APPROACHS

Ryunosuke Gando, Toshiba, Japan

12:20 AM

Live Q&A

1:10 AM – 1:30 AM

Break/Open Discussion

Tuesday, March 23

Program is listed in UTC Time.

1:30 AM – 4:05 AM

B2L-A: MEMS Gyroscopes II Asia

Session Chair(s): **Ryuta Araki** (SUMITOMO PRECISION PRODUCTS CO)

1:30 AM

Invited Talk: High Performance Rate-Integrated MEMS Gyroscope Around the Corner

Xiao Dingbang, National University of Defense Technology, China

2:00 AM

Theoretical Consideration of Mismatch Compensation for MEMS Resonator Having Unaligned Principle Axes

Takashiro Tsukamoto, Shuji Tanaka

Tohoku University, Japan

2:25 AM

The Parametric Amplification in MEMS Gyroscopes Based on Triple Resonant Frequency Signal

Kai Wu, Kuo Lu, Qingsong Li, Hao Zhang, Ming Zhuo, Xuezhong Wu, Dingbang Xiao

National University of Defense Technology, China

2:50 AM

Mode-Matched Multi-Ring Disk Resonator Using Single Crystal (100) Silicon

Jianlin Chen, Takashiro Tsukamoto, Shuji Tanaka

Tohoku University, Japan

3:15 AM

Q&A Panel

4:05 AM – 4:30 AM

Break/Open Discussion

8:00 AM – 10:35 AM

B3L-A: MEMS Gyroscopes III Europe

Session Chair(s): **Raphaël Levy** (Onera)

8:00 AM

Invited Talk: High performance MEMS accelerometer and gyro with a unique SMD and digital interface

Antoine Filipe, Tronic's Microsystems SA, France

8:30 AM

Exploiting Nonlinearities for Frequency-Matched MEMS Gyroscopes Tuning

Jacopo Marconi{1}, Giacomo Bonaccorsi{1}, Daniele Giannini{1}, Luca Falorni{2}, Francesco Braghin{1}

{1}Politecnico di Milano, Italy; {2}STMicroelectronics, Italy

8:55 AM

Digital Control of MEMS Gyroscopes: A Robust Approach

Fabrício Saggin{2}, Cécile Pernin{2}, Anton Korniienko{2}, Gérard Scorletti{2}, Christophe Le Blanc{1}

{1}Asygn, France; {2}Ecole Centrale de Lyon, Laboratoire Ampère, France

Tuesday, March 23 (cont.)

Program is listed in UTC Time.

9:20 AM

600 µdps/√Hz, 1.2 mm² MEMS Pitch Gyroscope

Marco Gadola{1}, Marc Sansa Perna{2}, Monica Allieri{1}, Philippe Robert{2}, Thierry Verdot{2}, Audrey Berthelot{2}, Giacomo Langfelder{1}

{1}Politecnico di Milano, Italy; {2}Université Grenoble Alpes, CEA-Leti, France

9:45 AM

Live Q&A

10:35 AM – 11:00 AM

Break/Open Discussion (Moderated by Coventor)

11:00 AM – 1:35 PM

B4L-A: MEMS Inertial Europe

Session Chair(s): Joan Giner (Bosch)

11:00 AM

Invited Talk: AI + MEMS

Markus Ulm (Bosch Sensortec)

11:30 AM

Experimental Investigation of Parametric Evasion Properties of Resonant Sensors Using Electrostatic Gap-Closing Actuation

Jerome Juillard{2}, Antonio Somma{2}, Alexis Brenes{1}

{1}LISITE, ISEP, France; {2}UMR8507, CNRS, CentraleSupélec, Université Paris-Saclay, Sorbonne Université, France

11:55 AM

Analysis and Compensation of Cross-Axis Sensitivity in Low-Cost MEMS Inertial Sensors

Tobias Hiller{1}, Lukas Blocher{1}, Milos Vujadinović{1}, Zsigmond Péntek{2}, Alexander Buhmann{1}, Hubert Roth{3}

{1}Robert Bosch GmbH, Germany; {2}Robert Bosch Kft, Hungary; {3}University of Siegen, Germany

12:20 PM

Finding the Critical Impact Energy for Micro Debris Generation in MEMS Inertial Sensors

Leonardo Gaffuri Pagani{1}, Luca Guerinoni{2}, Luca Falorni{2}, Patrick Fedeli{2}, Giacomo Langfelder{1}

{1}Politecnico di Milano, Italy; {2}STMicroelectronics, Italy

12:45 PM

Live Q&A

1:35 PM – 2:35 PM

Social Hour

3:00 PM – 5:55 PM

B5L-A: Accelerometers - Europe / USA

Session Chair(s): John Reinke (Honeywell International)

Tuesday, March 23 (cont.)

Program is listed in UTC Time.

3:00 PM

Resonant Accelerometer with Compliant Parallel Motion Linkage Force Amplification Mechanism

Omer HaLevy, Stella Lulinsky, Slava Krylov
Tel Aviv University, Israel

3:25 PM

SWaP Reduction for High Dynamic Navigation Grade Accelerometer Based on Quartz VBA Technology

Rachid Taïbi, Olivier Jolly, Thomas Kerrien, Pascal Labarthe, Karl Aubry, Gauthier Le Bihan, Stéphanie Michel
iXblue, France

3:50 PM

A 10 Nano-G/Rt-Hz Resonant MEMS Accelerometer Employing Anti-Aliasing Control

Milind Pandit{1}, Guillermo Sobreviela{1}, Callisto Pili{1}, Philipp Steinmann{1}, Douglas Young{1}, Chun Zhao{2}, Colin Baker{1}, Ashwin Seshia{2}
{1}Silicon Microgravity Ltd., United Kingdom; {2}University of Cambridge, United Kingdom

4:15 PM

Megahertz Bandwidth Bulk Micromachined Optomechanical Accelerometer with Fiber Optical Interconnects

Daniel Dominguez, Lisa Hackett, Michael Miller, Jennifer Restrepo, Katya Casper, Matt Eichenfield
Sandia National Laboratories, United States

4:40 PM

Method for the Synchronization of Data Recorders by Coupling Accelerometer Data

José Ricardo Scarpari{3}, Camila Deolindo{1}, Maria Adelia Aratanha{1}, Mauricio Ribeiro{1}, Anderson de Souza{2}, Elisa Kozasa{1}, Daisy Hirata{3}, José Elias Matieli{3}, Roberto Gil Annes Da Silva{3}, Carlos Henrique Forster{3}
{1}Hospital Israelita Albert Einstein, Brazil; {2}Instituto de Pesquisas e Ensaio em Voos, Brazil; {3}Technological Institute of Aeronautics, Brazil

5:05 PM

Live Q&A

5:55 PM – 6:30 PM

Break/Open Discussion

7:00 PM – 10:05 PM

B6L-A: Atomic Sensors - Europe / USA

Session Chair(s): **Philippe Bouyer** (Institut d'Optique Graduate School)

7:00 PM

Invited Talk: Atom Interferometer Accelerometer

John Close (Australian National University)

Tuesday, March 23 (cont.)

Program is listed in UTC Time.

7:30 PM

The Development of a High Data Rate Atom Interferometric Gravimeter (HIDRAG) for Gravity Map Matching Navigation

Benjamin Adams{2}, Calum Macrae{2}, Mani Entezami{2}, Kevin Ridley{2}, Archie Kubba{2}, Yu-Hung Lien{2}, Sachin Kinge{1}, Kai Bongs{2}

{1}Toyota Motor Europe, Belgium; {2}University of Birmingham, United Kingdom

7:55 PM

Invited Talk: Packaging for Cold Atom Sensors

Dana Anderson (ColdQuanta)

8:25 PM

Cold Atom Interferometers Based on Diffractive Optics and Integrated Photonics

Jongmin Lee

Sandia National Laboratories, United States

8:50 PM

Scale-Factor Stability Control Technique for Closed-Loop All-Fiber Interferometric Optical Gyroscope

Michal Skalský, Jiří Fialka, Ladislav Kopečný, Zdeněk Havránek

Brno University of Technology, Czech Rep.

9:15 PM

Live Q&A

10:05 PM – 10:30 PM

Break/Open Discussion (Moderated by Northrop Grumman)

Tuesday, March 23 / Wednesday, March 24

Program is listed in UTC Time.

11:00 PM – 2:00 AM

B7L-A: Aided Navigation - Asia / USA

Session Chair(s): **Charles Lange** (Johns Hopkins University Applied Physics Laboratory)
Toshiyuki Tsuchiya (Kyoto University)

11:00 PM

Sensor Fusion to Improve State Estimate Accuracy Using Multiple Inertial Measurement Units
Ujjval Patel, Imraan Faruque
Oklahoma State University, United States

11:25 PM

Simulation Design of Thermopile and Magnetometer Aided INS/GPS Navigation System for UAV Navigation
Atsumi Toda, Yoshikazu Koike
Shibaura Institute of Technology, Japan

11:50 PM

Performance Analysis of 3D NDT Scan Matching for Autonomous Vehicles Using INS/GNSS/3D LiDAR-SLAM Integration Scheme
Surachet Srinara, Chi-Ming Lee, Syun Tsai, Guang-Je Tsai, Kai-Wei Chiang
National Cheng Kung University, Taiwan

12:15 AM

FaStER: Fast, Stable, Expendable and Reliable Radio Map for Indoor Localization
Md Abdulla Al Mamun, David Vera Anaya, Mehmet Rasit Yuce
Monash University, Australia

12:40 AM

Invited Talk: Magnetic Navigation Aiding
Aaron Canciani (U.S. Air Force)

1:10 AM

Live Q&A

2:00 AM – 2:30 AM

Break/Open DIscussion

Wednesday, March 24

Program is listed in UTC Time.

11:00 AM – 12:00 PM

Social Hour

12:00 PM – 2:30 PM

C1L-A: Human Activity Recognition - Europe / USA

Session Chair(s): **Sina Askari** (ECS Federal - DARPA SETA),
Radwan Noor (King Abdulaziz City for Science and Technology)

12:00 PM

Towards the Automatic Data Annotation for Human Activity Recognition Based on Wearables and BLE Beacons

Florenc Demrozi{2}, Marin Jereghi{1}, Graziano Pravadelli{1}
{1}Computer Science, University of Verona, Italy; {2}University of Verona, Italy

12:25 PM

Insole-Based Real-Time Gait Analysis: Feature Extraction and Classification

Arif Reza Anwary{3}, Damla Arifoglu{4}, Michael Jones{1}, Michael Vassallo{2}, Hamid Bouchachia{1}
{1}Bournemouth University, United Kingdom; {2}Royal Bournemouth Hospital, United Kingdom; {3}Swansea University, United Kingdom; {4}University College London, United Kingdom

12:50 PM

Trains Detection Using State of Polarization Changes Measurement and Convolutional Neural Networks

Petr Dejdar, Vojtech Myska, Petr Munster, Radim Burget
Brno University of Technology, Czech Rep.

1:15 PM

Improved Sensor Based Human Activity Recognition via Hybrid Convolutional and Recurrent **Neural Networks**

Sonia Perez-Gamboa, Qingquan Sun, Yan Zhang
California State University San Bernardino, United States

1:40 PM

Live Q&A

2:30 PM – 3:00 PM

Break/Open Discussion

3:00 PM – 5:05 PM

C2L-A: Industry MEMS Inertials - Europe / USA

Session Chair(s): **Jenna F. Chan** (U.S. Army CCD Army Research)

3:00 PM

Purely Inertial Navigation with a Low-Cost MEMS Sensor Array

Lukas Blocher{3}, Wolfram Mayer{3}, Marco Arena{3}, Dušan Radović{2}, Tobias Hiller{3}, Joachim Gerlach{1}, Oliver Bringmann{4}
{1}Albstadt-Sigmaringen University, Germany; {2}Bosch Sensortec GmbH, Germany; {3} Robert Bosch GmbH, Germany; {4}University of Tuebingen, Germany

Wednesday, March 24 (cont.)

Program is listed in UTC Time.

3:25 PM

Development of a Navigation-Grade MEMS IMU

Burgess Johnson{1}, Curt Albrecht{1}, Todd Braman{1}, Kevin Christ{2}, Patrick Duffy{1}, Dan Endean{1}, Markus Gnerlich{1}, John Reinke{1}
{1}Honeywell International, United States; {2}Medtronic, United States

3:50 PM

Polaris - a Low Cost MEMS Fabrication Platform for Navigation-Grade Inertial Sensors

David Lin, Robert Macdonald, Dorin Calbaza, Jeremy Popp, Tammy Johnson, Emad Andarawis, Marco Aimi
GE Research, United States

4:15 PM

Live Q&A

5:05 PM – 5:30 PM

Break/Open Discussion (Moderated by Inertial Sensor Design)

Thursday, March 25
Program is listed in UTC Time.

2:00 AM
Student Awards and 2022 Promo Asia
Michael Larsen (Northrop Grumman), **Olivier Le Traon** (ONERA)

8:20 AM – 10:00 AM
D1L-A: Late News Asia
Session Chair(s): **Tamio Ikehashi** (Waseda University)

8:20 AM
A Technique for Modeling and Simulating Transistor Based MEMS Sensors
Pramod Martha{2}, Anju Sebastian{1}, V Seena{2}, Naveen Kadayinti{3}
{1}Indian Institute of Science, Bangalore, India; {2}Indian Institute of Space Science and Technology, Trivandrum, India; {3}Indian Institute of Technology, Dharwad, India

8:45 AM
A 3-D Capacitive-Detection Electrode for a Single Gold Proof-Mass Three-Axis MEMS Accelerometer
Takashi Ichikawa{2}, Akihiro Uchiyama{2}, Kohei Shibata{2}, Shinichi Iida{1}, Sangyeop Lee{2}, Noboru Ishihara{2}, Katsuyuki Machida{2}, Kazuya Masu{2}, Hiroyuki Ito{2}
{1}NTT Advanced Technology Corp., Japan; {2}Tokyo Institute of Technology, Japan

9:10 AM – 10:00 AM
Live Q&A

10:00 AM – 10:30 AM
Break/Open Discussion

3:00 PM
Student Awards and 2022 Promo Europe / USA
Michael Larsen (Northrop Grumman), **Olivier Le Traon** (ONERA)

3:20 PM – 5:25 PM
D2L-A: Late News USA
Session Chair(s): **Giacomo Langfelder** (Politecnico di Milano)
Sina Askari (ECS Federal - DARPA SETA)

3:20 PM
A Sub-Micro-G Resolution Frequency-Modulated Piezoelectric In-Plane Accelerometer
Seungyong Shin, Anosh Daruwalla, Zhenming Liu, Farrokh Ayazi
Georgia Institute of Technology, United States

3:45 PM
A Novel Spring Disk Resonator Gyroscope for Maximizing Q/F
Christopher Cameron{1}, Dustin Gerrard{2}, Janna Rodriguez{1}, Yushi Yang{1}, Eldwin Ng{1}, Thomas Kenny{1}
{1}Stanford University, United States; {2}Waymo, United States

Thursday, March 25 (cont.)

Program is listed in UTC Time.

4:10 PM

Microfabricated Optically Pumped Gradiometer with Uniform Buffer Gases

Austin Parrish{2}, Radwan Noor{1}, Andrei Shkel{2}

{1}King Abdulaziz City for Science and Technology, Saudi Arabia; {2}University of California, Irvine, United States

4:35PM: **Live Q&A**

5:25 PM

Closing Remarks

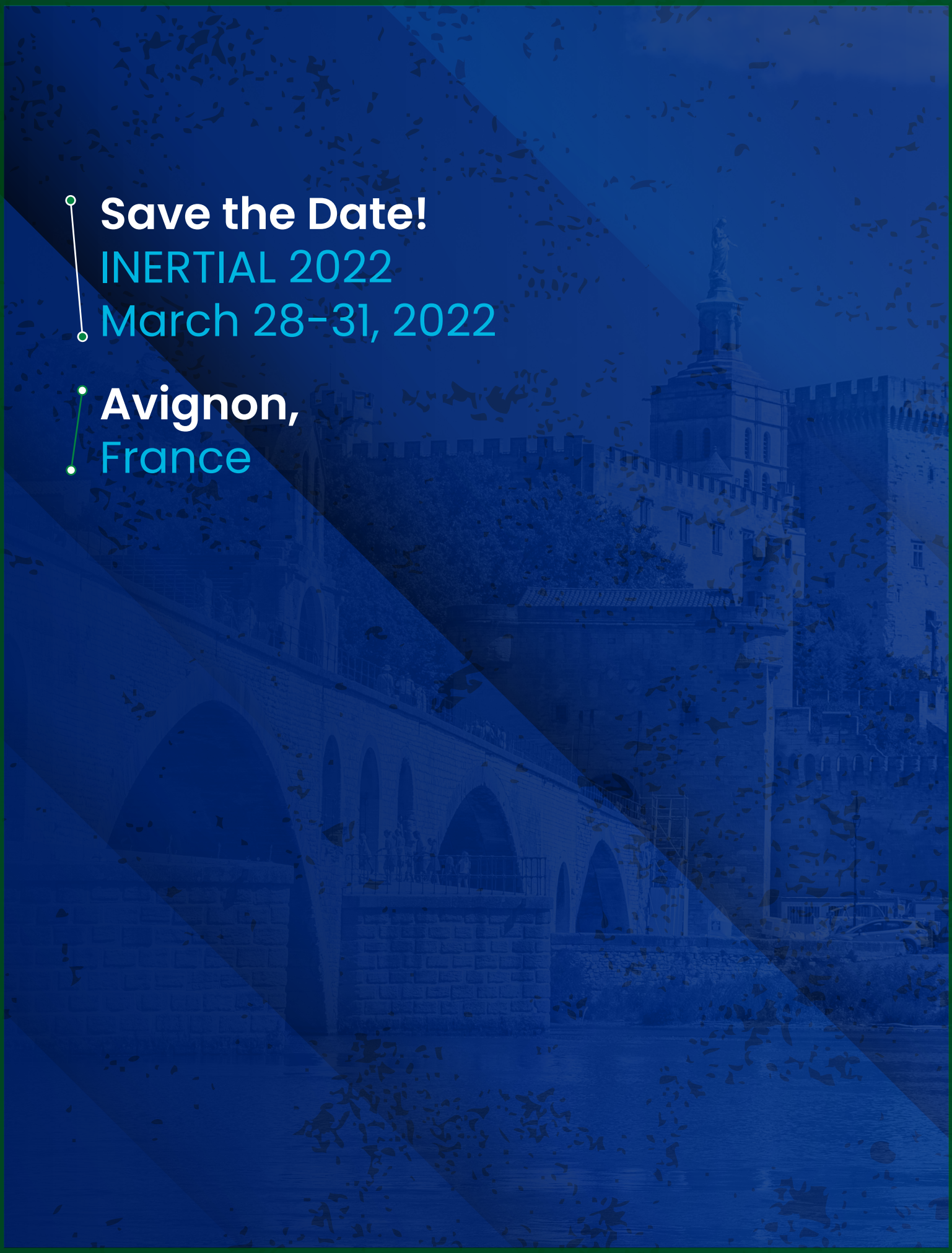
Michael Larsen (Northrop Grumman), **Ron Polcawich** (DARPA)

5:25 PM

Open Discussion

6:15 PM – 7:15 PM

Northrop Grumman Webinar


Save the Date!
INERTIAL 2022
March 28-31, 2022
Avignon,
France