IEEE Inertial Sensors & Systems Symposium 2018 Organizers

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Andrea Pizzarulli, Civitanavi Systems srl, Italy
Igor Prikhodko, Analog Devices Inc., United States
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Diego Serrano, Qualtre, United States
Ryan Supino, Honeywell, United States
Shuji Tanaka, Tohoku University, Japan
Alessandro Tocchio, ST Microelectronics Inc., Italy
Alexander Trusov, Northrop Grumman, United States
Takashiro Tsukamoto, Tohoku University, Japan
Jae Yoong Cho, University of Michigan, USA
Rong Zhang, Tsinghua University, China

Symposium Management:
Conference Catalysts, LLC, United States
Exhibitors

Exhibits will be in the Varenna & Cernobbio. Opening at 8:00 AM, Tuesday, March 28 and closing at 4:00 PM, Wednesday, March 29.
Tutorials

Monday, March 26

08:30 - 10:30
System-Level Considerations in Inertial Sensor Performance
Room: Bassanini

Instructor: Professor Michael Braasch, Ohio University

Abstract: Most inertial navigation systems operate at three basic task-rates: high-speed, medium-speed and low-speed. High-speed tasks include formation and compensation of the raw delta-Vs and delta-thetas. Medium-speed tasks include attitude determination and velocity update. Low-speed tasks include position update and gravity calculation. Most inertial sensor designers concentrate their efforts in the high-speed task arena. Once the measurements have been formed and compensated, they are sent off to the systems and software engineers. This tutorial provides an overview of those ‘downstream’ tasks and focuses particularly on the long-term impact of sensor errors on inertial navigation system performance. Key error characteristics such as the Schuler, Foucault and Diurnal oscillations will be discussed. Which is more important? Gyro bias or accel bias? The answer is that it depends on the length of the mission! We will go through the details as well as highlight the criticality of additional performance metrics such as scale factor error, noise, data rate and data latency.

11:00 – 13:00
Non-GPS Aiding of INS
Room: Bassanini

Instructor: Professor Kai Bongs, University of Birmingham

Abstract: This tutorial will introduce atom interferometry for inertial sensing and for timekeeping. Atom interferometers have been first demonstrated 25 years ago and are now being developed in several places worldwide in to mobile systems with potential for real world applications. They offer precision measurements of rotation and acceleration. A key feature is the potential for operation with negligible drift and very linear scale factor. The tutorial will provide an overview of current developments and an outlook into future applications in navigation.
Tutorials

14:15 - 16:15
Modeling of offset and offset drift sources in AM/FM inertial sensors
Room: Bassanini

Instructor: Dr. Alessandro Tocchio, STMicroelectronics

Abstract: This tutorial will focus on the main contributors affecting MEMS inertial sensors performance in terms of accuracy. This parameter is of paramount importance in order to enable new markets and applications such as augmented and mixed reality, pedestrian or indoor navigation, etc. In particular, starting from the basic working principles of MEMS AM gyroscopes and a MEMS AM accelerometer based on capacitive sensing technique, the main phenomena affecting Zero-rate Level (ZRL) and Zero-G offset (ZGO) accuracy will be introduced. The origins of these phenomena and how they influence both the mechanical and the electrical world will be tackled analytically, and the approaches used to simulate them will be described.
Invited Speakers

Tuesday, March 27
09:00 - 09:30
I1: Invited Talk
Room: Bassanini

How high-volume MEMS device manufacturers can meet the requirements of different markets
Dr. Andrea Onetti, STMicroelectronics

Abstract:
ST was at the forefront in bringing MEMS technology to the high volume consumer market. Today the Internet of Things and Smart Driving trends are creating opportunities to make existing and new devices and applications smarter through the use of intelligent connected sensing technologies. This applies to factories and workplaces, cities, homes, vehicles and all the devices that can be found there.

The latest generations of MEMS products and technologies are developed to meet the needs of consumer applications while also targeting emerging automotive and industrial applications. Targeting different markets requires manufacturers to supply sensors with different characteristics but built on the same technology platforms. One key characteristic that differs by market is the accuracy the sensor is required to meet while another key characteristic is the combination of sensing functions that a device needs to have.

This talk will address how MEMS device manufacturers can meet the varied requirements of different markets while building on the high-volume manufacturing capabilities that are already in place for the consumer industry.

Wednesday, March 28
09:00 - 09:30
I2: Invited Talk
Room: Bassanini

Sub-femto-g free-fall with LISA Pathfinder
Stefano Vitale, University of Trento, Istituto Nazionale di Fisica Nucleare, and Agenzia Spaziale Italiana, Italy

Abstract:
The talk will briefly review the concept of a space-borne gravitational wave (GW) detector, and of its needs of pure inertial motion (geodesic motion) of reference test-masses. It will discuss then the sub-femto-g performance demonstrated by LISA Pathfinder, ESA’s precursor to the LISA GW detector, and its impact on LISA and on the field of gravitational missions at large.
Invited Speakers

Wednesday, March 28
14:00 – 14:30
I3: Invited Talk
Room: Bassanini

The Machine of Bohnenberger: Inertial Link between Astronomy, Navigation, and Geodesy

Jörg F. Wagner, University of Stuttgart

Abstract:
The “Machine of Bohnenberger” is considered to be the first gyro with cardanic suspension. As this apparatus forms the precursor of Foucault’s Gyroscope of 1852, it rates as the ancestor of all gyroscopic instruments. Its inventor, Johann Gottlieb Friedrich Bohnenberger (1765-1831), was a professor of physics, mathematics, and astronomy at the University of Tübingen, Germany, as well as the scientific head-surveying officer of the early Kingdom of Württemberg. Being the direct counterpart of C.F. Gauß in south-west Germany, he made major contributions to introducing modern geodesy in Germany; and besides his Machine, he designed also other various physical instruments. The paper gives an overview over the initial dissemination and the further development of the Machine of Bohnenberger and outlines Bohnenberger’s scientific work and life.

Thursday, March 29
09:00 - 09:30
I2: Invited Talk
Room: Bassanini

HRG by SAFRAN, the game-changing technology

Fabrice Delhaye, Safran Electronics & Defense

Abstract:
Whereas the world inertial navigation community was wondering, for decades, if FOG would ultimately replace RLG, Safran is demonstrating with its HRG than technology prospective is not such easy game. With its HRG, Safran is proving that the HRG innovative approach is a real game changer in high end navigation. This paper sums up the overall principles of HRG, how it works and its intrinsic properties. Current applications of HRG are described to illustrate how HRG benefits are capitalized in valued-added products. More prospective aspects of the HRG are also addressed with the latest tests results of performance limits exploration.
## Monday, March 26

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<tr>
<th>Time</th>
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<td>07:00 - 16:00</td>
<td>Tutorial Registration</td>
<td>Bassanini Foyer</td>
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| 08:30 - 10:30| **Tutorial 1: System-Level Considerations in Inertial Sensor Performance**  
Instructor: Professor Michael Braach, *Ohio University*  
Room: Bassanini |               |
| 10:30 - 11:00| Coffee Break                                               | Bassanini Foyer|
| 11:00 – 13:00| **Tutorial 2: Atom Interferometer Inertial Sensors**  
Instructor: Professor Kai Bongs, *University of Birmingham*  
Room: Bassanini |               |
| 13:00 - 14:15| Lunch                                                      | Restaurant La Cascata |
| 14:15 – 16:15| **Tutorial 3: Modeling of offset and offset drift sources in AM/FM inertial sensors**  
Instructor: Dr. Alessandro Tocchio  
Room: Bassanini |               |
| 18:00 - 20:00| Welcome Reception                                          | Bassanini     |

All attendees are invited to the Welcome Reception for drinks and light hors d'oeuvres.
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<td>Room: Bassanini Foyer</td>
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<tr>
<td>08:45 - 09:15</td>
<td>Opening Remarks</td>
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<td>Andrei Shkel, 2018 General Chair</td>
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<td>Room: Bassanini</td>
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<tr>
<td>09:15 - 09:45</td>
<td><strong>I1: Invited Talk: Dr. Andrea Onetti, STMicroelectronics</strong></td>
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<td>How high-volume MEMS device manufacturers can meet the requirements of different markets</td>
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<td>Dr. Andrea Onetti</td>
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<td>STMicroelectronics</td>
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<td>09:45 - 10:45</td>
<td><strong>T1: Instrumentation, Calibration and Testing</strong></td>
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<td>Rate table improvements in rate stability using look-up tables</td>
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<td></td>
<td>André Niederberger, Acutronic Switzerland Ltd., Switzerland</td>
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<td></td>
<td>A Micro Thermal and Stress Isolation Platform for Inertial Sensors</td>
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<td></td>
<td>Donguk Max Yang(^1), Khalil Najafi(^1), David Lemmerhirt(^2),</td>
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<td>Jay Mitchell(^2)</td>
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<td>The University of Michigan(^1), USA; ePack, Inc., USA(^2)</td>
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<tr>
<td></td>
<td>Calibration and simultaneous measurement of MEMS gyroscope</td>
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<td></td>
<td>Mikulas Jandak, Honeywell International &amp; TU Wien, Czech Republic</td>
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<td>10:45 - 11:05</td>
<td>Exhibitors’ Highlights</td>
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<td>11:05 - 11:30</td>
<td>Coffee Break &amp; Exhibits</td>
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<td>11:30 - 12:30</td>
<td><strong>T2: INS, NAV-grade systems and AHRS</strong></td>
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<td></td>
<td>MEMS Enabled Navigation Grade Accelerometer</td>
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<td></td>
<td>Brian Homeijer, Ryan Shaffer</td>
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<td><em>Sandia National Laboratories, USA</em></td>
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<td>FOG based INS for satellite launcher application</td>
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<td>Daniele Grifi, Roberto Senatore, Enrico Quatraro, Massimo Verola and Andrea Pizzarulli</td>
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<td><em>Civitanavi Systems, Italy</em></td>
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<td></td>
<td>Optimization of Gyroscope and Accelerometer/Magnetometer Portion of Basic Attitude and Heading Reference System</td>
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<td>Simone Ludwig¹, Antonio R. Jimenez²</td>
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<td></td>
<td><em>North Dakota State University, USA¹</em>; Jimenez Centre for Automation and Robotics. CSIC-UPM, Spain²*</td>
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<td>12:30 - 14:00</td>
<td>Lunch</td>
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<td>Room: Restaurant La Cascata</td>
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<td>14:00 – 14:40</td>
<td><strong>T3: Emerging Applications</strong></td>
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<td>Monitoring Earthquake through MEMS Sensors (MEMS project) in the town of Acireale (Italy)</td>
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<td>Antonino D’Alessandro, Salvatore Scudero, Giovanni Vitale, Roberto D’Anna, Luca Greco, Stefano Speciale, Giuseppe Passafiume</td>
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<td></td>
<td><em>Istituto Nazionale di Geofisica e Vulcanologia, Italy</em></td>
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<td>Towards Self-Navigating Cars using MEMS IMU: Challenges and Opportunities</td>
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<td>Igor Prikhodko, Brock Bearss, Carey Merritt, Charles Blackmer</td>
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<td><em>Analog Devices, USA</em></td>
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<td>14:40 - 15:10</td>
<td>Lightning Round Presentations of the following Poster Session</td>
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**Session will be "Lightning Round" Presentations (2 min X 13 posters) in Bellagio**

P1-1: A dual-mass frequency-modulated (FM) pitch gyroscope: mechanical design and modelling
Valentina Zega¹, Claudia Comi¹, Patrick Fedeli¹, Attilio Frangi¹, Alberto Corigliano¹, Paolo Minotti¹, Giacomo Langfelder¹, Luca Falorni², Alessandro Tocchio²
Politecnico Milano, Italy¹; STMicroelectronics, Italy²

P1-2: Quartz Cylindrical Resonators for Mid-Accuracy Coriolis Vibratory Gyroscopes
Mikhail Basarab¹, Boris Lunin², Evgeniy Chumankin³, Alexey Yurin¹
Bauman Moscow State Technical University, Russia¹; Moscow State University n. a. Lomonosov, Russia²; JSC ANPP TEMP-AVIA, Arzamas, Russia³

P1-3: Lateral Diffusion Doping of Epitaxial Silicon for Temperature Compensation of MEMS Resonators
Dongsuk D. Shin¹, David B. Heinz¹, Hyun-Keun Kwon¹, Yunhan Chen², Thomas Kenny¹
Stanford University, USA¹; Apple Incorporated, USA

P1-4: A control strategy for Coriolis and centrifugal effects reduction in an inertial system test equipment
Bernard Vau, Damien Ponceau, Mehdi Bussutil
Ixblue, France

P1-5: A comprehensive model of beams’ anisoeelasticity in MEMS gyroscopes with focus on the effect of axial non-vertical etching
Mohammad Izadi¹, Francesco Braghin¹, Daniele Giannini¹, Damiano Milani¹, Ferruccio Resta¹, Matteo Brunetto², Luca Falorni², Gabriele Gattere³, Luca Guerinoni², Carlo Valzasina²
Politecnico Milano, Italy¹; STMicroelectronics, Italy²

P1-6: Theoretical model and experiments of glass reflow process in TGV for 3D wafer-level packaging
Yunbin Kuang, Jian Zhou, Wenyin Li, Hongjuan Cui
National University of Defense Technology, P.R. China

P1-7: Virtually Rotated MEMS Whole Angle Gyroscope using Independently Controlled CW/CCW Oscillations
Takahiro Tsukamoto, Shuji Tanaka
Tohoku University, Japan

P1-8: A system-level comparison of amplitude- vs frequency-modulation approaches exploited in low-power MEMS vibratory gyroscopes
Paolo Minotti¹, Giorgio Mussi¹, Giacomo Langfelder¹, Valentina Zega¹, Stefano Facchinetti², Alessandro Tocchio²
Politecnico Milano, Italy¹; STMicroelectronics, Italy²

P1-9: Investigating the Impact of Resonant Cavity Design on Surface Acoustic Wave Gyroscope
Ashraf A Mahmoud, Mohamed Mahmoud, Tamal Mukherjee, Gianluca Piazza
Carnegie Mellon University, USA
Tuesday, March 27

P1-10: The 4th Harmonic Angular Drift Error in MEMS Vibratory Rate Integrating Gyroscopes
Zhongxu Hu, Barry Gallacher
Newcastle University, United Kingdom, Great Britain

P1-11: Resonance Frequency Control and Digital Correction for Capacitive MEMS Gyroscopes within electromechanical Bandpass Delta-Sigma-Modulators
Michael Maurer¹, Stefan Rombach¹, Yiannos Manoli²
Hahn-Schickard, Germany¹; Hahn-Schickard & IMTEK University of Freiburg, Germany²

P1-12: Modeling of temperature frequency-compensation of doped silicon MEMS resonator
Payman Rajai¹, Matthew Straeten³, Jiewen Liu¹, George Xereas², Mohammed Jalal Ahamed⁷
University of Windsor, Canada¹; NXTSENS Microsystems Inc, Canada²

P1-13: Decoupled Rate and Quadrature Servos in a MEMS Gyroscope
David Hayner
Coherent Sensors, Inc., USA

P1-14: Predicting Height and Determining Mass of Foaming Agents for Glass Shell Resonators
Bin Luo¹, Jintang Shang¹, Zhaoxi Su¹, Ching-Ping Wong²
Southeast University, P.R. China¹; The Chinese University of Hong Kong, USA²

P1-15: Geometrical compensation of (100) single-crystal silicon mode-matched vibratory ring gyroscope
Shu Yunyi, Yoshikazu Hirai, Toshiyuki Tsuchiya, Osamu Tabata
Kyoto University, Japan

P1-16: Adaptive Feedthrough Cancelation in MEMS Gyroscopes In Reconfigurable IC+FPGA Platform
Joan Giner¹, Kazuo Ono²
Hitachi Center for Technology Innovation, Japan¹; Hitachi, Ltd., Japan²

17:00 - 18:00
Open Posters
Room: Varenna & Cernobbio

All attendees are invited to the Open Poster Session for drinks and light hors d'oeuvres
**Wednesday, March 28**

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<td>Room: Bassanini Foyer</td>
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<tr>
<td>09:00 - 09:10</td>
<td>Welcome Comments, Day 2</td>
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<td>Andrei Shkel, 2018 General Chair</td>
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<td>Room: Bassanini</td>
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<td>09:10 - 09:40</td>
<td>Invited Speaker: Stefano Vitale, University of Trento, Istituto</td>
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<td>Room: Bassanini</td>
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<td>Session Chair: Andrei Shkel, University of California, Irvine, USA</td>
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<td>09:40 - 10:40</td>
<td>MEMS Accelerometers</td>
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<td></td>
<td>**Single Resonator, Time-switched, low Offset Drift z-axis FM MEMS</td>
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<td>Accelerometer</td>
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<td>Cristiano Marra(^2), Filippo Ferrari(^2), Giacomo Langfelder(^2), Francesco Rizzini(^1), Alessandro Tocchio(^1)</td>
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<td>**Electro-mechanical Chopping &amp; Modulation of Acceleration: the</td>
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<td>Geometry-modulated Accelerometer</td>
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<td>Cristiano Marra(^2), Filippo Ferrari(^2), Giacomo Langfelder(^2), Francesco Rizzini(^1), Alessandro Tocchio(^1)</td>
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<td>**High-Density Wide-Range Digital Accelerometer Arrays with High</td>
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<td>Detection Resolution</td>
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<td>Yemin Tang</td>
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<td><em>University of Michigan Ann Arbor, USA</em></td>
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10:40 - 11:10
Lightning Round Presentations of the following Poster Session
Room: Bassanini

**Session will be "Lightning Round" Presentations (2 min X 13 posters) in Bassanini**

11:10 - 13:00
P2: Accelerometers, Magnetometers, IMUs
Room: Bellagio

**Session will include Poster Discussion, Coffee Break & Exhibit Inspection**

P2-1: Automated tuning of Kalman Filters
Wojciech Straszewski, Magdalena Drozdz, Hendrik Wouters
Fugro, The Netherlands

P2-2: Combined electronics and algorithm development for offset drift characterization in MEMS accelerometers
Federico Maspero1, Victor Fernandez López-Rey2, Loïc Joet2, Sébastien Hentz3, Giacomo Langfelder2
University of Grenoble & CEA-Leti, France; Politecnico di Milano, Italy; CEA-Leti, France

P2-3: Simulation methods for generating reduced order models of MEMS sensors with geometric nonlinear drive motion
Martin Putnik1, Stefano Cardanobile1, Mateusz Sniegucki1, Steven Kehberg1, Matthias Kuehnelt1, Peter Degenfeld-Schonburg1, Cristian Nagel2, Jan Mehner3
Robert Bosch GmbH, Germany1; Robert Bosch GmbH Renningen, Germany2; Technische Universität Chemnitz, Germany3

P2-4: Liquid Package Effects of Piezoresistive MEMS Accelerometer
Liu Xixiang1, Libo Zhao1 and Weile Jiang1, Chen Jia1, MingZhi Yu1,2, Jiang Zhuangde2
Xi'an Jiaotong University, P.R. China1; State Key Laboratory for Manufacturing Systems Engineering, P.R. China2

P2-5: A Biologically-inspired Hair Accelerometer Based on Resonant Sensing
Bo Yang
Southeast University, P.R. China

P2-6: A 27μW MEMS Silicon Oscillating Accelerometer with 4-μg Bias Instability and 10-μg/√Hz Noise Density
Xi Wang1, Guo Ming Xia2, Yang Zhao2, Jian Zhao2, An Ping Qiu2, Yan Su2, Yong Ping Xu3
China University of Mining and Technology & National University of Singapore, P.R. China1; Nanjing University of Science and Technology, P.R. China2; National University of Singapore, Singapore3

P2-7: Attitude determination in dead reckoning navigation with reduced inertial support
Yakov Binder
Concern CSRI Elektropribor, Russia

P2-8: High-precision inertial measurement unit IMU-5000
Yuri Korkishko, Vyacheslav Fedorov, Viktor Prilutskiy, Vladimir Ponomarev, Igor Fedorov, Sergey Kostritski, Ivan Morev, Dmitriy Obuhovich, Stanislav Prilutskiy, Aleksandr Zuev and Vasily Varnakov
RPC Optolink, Russia
Wednesday, March 28

P2-9: Experimental investigation of MEMS DRIE etching dimensional loss
Francesco Rizzini, Gabriele Gattere, Lorenzo Corso, Anna Alessandri, Francesco Tripodi, Ilaria Gelmi
ST Microelectronics, Italy

P2-10: In-flight magnetometer calibration in the projectile frame
Ronan Adam
French-German Research Institute of Saint-Louis, France

P2-11: Modeling of a vibrating MEMS magnetometer partially covered with a ferromagnetic thin film
Thomas Perrier\textsuperscript{1,2}, Raphaël Levy\textsuperscript{2}, Patrick Kayser\textsuperscript{2}, Béatrice Verlhac\textsuperscript{2}, Johan Moulin\textsuperscript{1}
University Paris Sud, France\textsuperscript{1}; ONERA, France\textsuperscript{2}

P2-12: Auto-Zero Baseline Correction Circuit for MEMS Accelerometer Based Seismic Sensor
Panagiotis Ioakim, Iasonas Triantis
City University of London, United Kingdom (Great Britain)

P2-13: Compact Atomic Magnetometer for Global Navigation (NAV-CAM)
Michael Larsen, Michael Bulatowicz, Dennis Bevan, Philip Clark, Robert Griffith, Marta Luengo-Kovac, James Pavell
Northrop Grumman, USA

12:30 - 14:30
Lunch
Room: Restaurant La Cascata

14:30 – 15:00
I3: Invited Speaker: Joerg F. Wagner, University of Stuttgart, Germany
Room: Bassanini

The Machine of Bohnenberger: Inertial Link between Astronomy, Navigation, and Geodesy
Jörg F. Wagner
University of Stuttgart

15:00 - 15:40
T5: IMUs
Room: Bassanini

Heteromagnetic Sensors Motion Parameters Of Moving Objects
Aleksandr Skripkin
TU - Saratov, Russia

Human Activity Recognition Method based on Inertial Sensor and Barometer
Lili Xie, Jun Tian, Genming Ding, Qian Zhao
Fujitsu Research & Development Center Co., LTD, P.R. China

15:40 - 16:10
Coffee Break & Exhibits
Room: Varenna & Cernobbio
### Wednesday, March 28

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<td><strong>T6: High-precision Gyroscopes and Resonators</strong></td>
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<td>Symmetric Piezoelectric CVG with Digital Control</td>
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<td>Glen Sanders, Lee Strandjord, Jianfeng Anthony Challoner</td>
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<td><em>InertialWave Inc., USA</em></td>
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<td>High quality factor MEMS gyroscope with whole angle mode of operation</td>
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<td>Mansoor Alam, Sina Askari, Mohammad H. Asadian, Andrei Shkel</td>
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<td><em>University of California Irvine, USA</em></td>
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<td>Simulation-Based Approach for Fabrication of Micro-Shell Resonators</td>
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<td>with Controllable Stiffness and Mass Distribution</td>
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<td>Behrouz Shiari, Tal Nagourney, Sajal Singh, Jae Yoong Cho, Khalil Najafi</td>
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<td><em>University of Michigan, USA</em></td>
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<td>18:00 - 20:00</td>
<td><strong>Banquet Dinner</strong></td>
<td>Restaurant La Cascata</td>
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Thursday, March 29

08:00 - 12:00  
**Registration**  
*Room:* Bassanini Foyer

09:00 – 09:30  
**Welcome Comments & Awards Ceremony, Day 3**  
*Andrei Shkel, 2018 General Chair*  
*Room:* Bassanini

09:30 – 10:00  
**I4: Invited Talk: Fabrice Delhaye, Safran Electronics & Defense**  
*Room:* Bassanini

**HRG by SAFRAN, the game-changing technology**  
Fabrice Delhaye  
*Safran Electronics & Defense*

10:00 - 11:30  
**T6: Fabrication, Phenomena and Modeling**  
*Room:* Bassanini

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**Investigation on precise frequency trimming of a micro shell resonator with T-shape masses using low-power femtosecond laser ablation**  
Kun Lu, Yan Shi, Dingbang Xiao, Zhanqiang Hou, Wei Li, Xuezhong Wu, Yulie Wu  
*National University of Defense Technology, P.R. China*

**Suppression of the resonance of vacuum-sealed accelerometers: a comparison of two different strategies**  
Bruno Fain, Frédéric Souchon, Audrey Berthelot, Romain Anciant, Philippe Robert, Guillaume Jourdan  
*CEA-LETI, France*

**A novel compensation method of damping asymmetry based on piezoelectric electrodes for cylindrical resonators**  
Jiangkun Sun, Yulie Wu, Xiang Xi, Yongmeng Zhang, Xuezhong Wu, Luozhen Qu  
*National University of Defense Technology, P.R. China*
Thursday, March 29

11:30 - 12:45
Late News 1
Room: Bassanini

Nuclear Magnetic Resonance Gyroscope (NMRG)
Michael Larsen¹, Dennis Bevan¹, James Pavell¹, Marta Luengo-Kovac¹, Michael Bulatowicz¹, Philip Clark¹, Robert Griffith¹, Julia Flicker¹, Ashely Rothballer¹, Daryl Sakaida¹, Gordon Morrison², Juan Campero², Elliot Burke², Steven Estrella², Brian Ehrams²
Northrop Grumman, USA¹; Freedom Photonics, USA²

200mm High Performance Inertial Sensor Manufacturing Process
Stephane Martel¹, Francois Dion¹, Jeffrey DeNatale²
Teledyne DALSA Semiconductor, Canada¹; Teledyne Scientific Company, USA²

Active Temperature Compensation of Thermal Accelerometer for Improved Stability
Kirsten Kaplan, Martin Winterkorn, Camille Everhart, Dongsuk D. Shin, Gary O'Brien, Fritz Prinz, Thomas Kenny
Stanford University, USA

Effect of Fabrication Imperfections on Energy Loss through Mechanical Mode Coupling
Daryosh Vatanparvar, Andrei M. Shkel
University of California, Irvine, United States

12:45 - 13:00
Closing Remarks
Andrei Shkel, 2018 General Chair
Room: Bassanini

14:39 – 17:15
Lake Como Boat Tour
Room: Bassanini

**More information to be announced**
Bassanini Room

**All technical sessions will be located in this room**