Seminars Micro-534 Advanced MEMS 2025

Schedule summary

Date	Title	Speaker
04.03.2025 12h15	Safran Navigation & Timing: High performance MEMS inertial sensors	Nadège Frantz, Safran Sensing Technologies Switzerland
18.03.2025 12h15	Optical MEMS – the renaissance of Mechanics in a watchmaking country	Cornel Marxer, Sercalo
25.03.2025 12h15	Sensirion: From ETH start-up to global leader in environmental and flow sensing	Lukas Bürgi, Sensirion
29.04.2025 12h15	APIX: NEMS based gas chromatograph	Eric Colinet, APIX analytics
13.05.2025 10h15	Packaging and hybridization, the valorization of MEMS technologies	Michel Despont, CSEM
20.05.2025 12h15	Triaxis, a 3D magnetometer for human-like manipulation	Théo Le Signor, Melexis

Safran Navigation & Timing: High performance MEMS inertial sensors

Speaker: Nadège Frantz, Safran Sensing Technologies Switzerland, Yverdon-les-Bains

Abstract

While most of the MEMS developments have been focused on low cost and low performance markets driven by the automotive and smartphone businesses, Safran Sensing Technologies (Part of Safran Navigation & Timing) has taken up the challenge to develop medium cost and high performance MEMS inertial sensors dedicated to high reliability and harsh environment applications. This challenge includes a versatile accelerometer platform sensor to develop, produce and test MEMS sensors according to the requirements of inertial navigation, vibration, high temperature and seismic applications and therefore cover the markets of aeronautics & defense, automotive, railway and structural monitoring.

The presentation will provide an overview of products and markets, illustrate the MEMS technologies and point out the key differentiators of our solutions.

Biography

Nadège Frantz joined Safran Sensing Technologies in 2016 as R&D Projects Manager to work on the development of new MEMS products. Nadège is MEMS Expert for Safran Electronics & Defense company. Prior to joining Safran, Nadège spent more than 15 years in semiconductor and micro-technologies industry at R&D side. Her career started in France at CNRS, developing micro-actuators. Nadège holds a PhD in MEMS/Material from Paris XI University (France).

Sensirion: From ETH start-up to global leader in environmental and flow sensing

Speaker: Lukas Bürgi, Sensirion, Stäfa

Abstract

Founded as ETH start-up in 1998, Sensirion today has yearly sales of over 100 million sensors into the automotive, medical, industrial and consumer markets. At the heart of most of these sensor solutions is a so-called CMOSens® component, which combines the MEMS sensor element with the analogue and digital signal processing circuitry on a single CMOS silicon chip.
In the first part of the lecture, I will give an overview of the company Sensirion: it's history, products, markets, and its value chain will be briefly addressed. The second part will be devoted to the technology behind two of Sensirion's product line: gas flow sensors and optical CO2 sensors. In the third and final part, I will give an impression of innovation and R&D work at Sensirion and point out similarities and differences to academic research.

Biography

Lukas Bürgi is Director R&D Sensor Innovation at Sensirion. He studied physics at ETHZ and holds a PhD in experimental physics from EPFL. After a post-doc at the Cavendish Laboratory in Cambridge UK, he worked for CSEM Zürich as an expert in organic optoelectronics. In 2008 he joined Sensirion as project leader in the R&D department for gas flow sensors. Since 2015 he is heading Sensirion's pre-development department.

Optical MEMS – or the renaissance of Mechanics in a watchmaking country

Speaker: Cornel Marxer, Sercalo, Neuchâtel

Abstract

Optical MEMS are those little silicon chips capable of manipulating light: Sercalo's chips can re-direct, attenuate or filter light. They do these operations using the oldest of techniques: mechanics. It's still charming in 2025.

In this talk we'll meet the different actuation principles and their devices. Sercalo uses electrostatic MEMS for fiber optic components. Magnetic mirrors are a better choice for beam steering and finally thermally actuated MEMS find typical applications in laser control.

After the introduction to Sercalo's optical MEMS, we'll discuss some successes and failures of Sercalo as a small high tech company.

Biography

Cornel Marxer studied micromechanics with Christophe Burckhardt at EPFL. He did his diploma work with Prof. Philippe Renaud in 1994, before joining the research group of Nico de Rooij in Neuchâtel. He did there a PhD on « Silicon Micromechanics for applications in fiber optic communication in 1999 ». Since then he's leading Sercalo Microtechnology Ltd.

Sercalo with a team of 40 employees produces 50'000 Optical MEMS assemblies every year in the company's own processing facilities in Neuchâtel.

APIX: NEMS-based gas chromatograph

Speaker: Eric Colinet, APIX analytics, Grenoble, France

Abstract

Apix-Analytics (http://www.apixanalytics.com/), the leader in Nano-Sensor (NEMS) based gas chromatography (GC) system is a start-up company from CEA-LETI and the California Institute of Technology (Caltech) founded in December 2011. The presentation will present why NEMS resonators offer a unique breakthrough technology in the GC field and will discuss how the key challenges such as industrialization, multi scale system integration combining mechanical, chemical and electronic sub-systems are addressed.

Biography

Eric Colinet graduated from INSA-Lyon France in 2002 and received a PhD from SUPELEC PARIS in 2005 and a HDR from INP- GRENOBLE in 2010. In 2011, he cofounded Apix-Analytics, a start-up company from CEA-LETI/CALTECH specialized in Nano-Sensor based gas analysis systems, where he is now managing the research and development activities. His field of expertise covers micro & nano electromechanical systems (MEMS-NEMS), sensors & actuators, control theory & signal processing, solid-state electronics & IC, MEMS-CMOS Integration. He is the author of more than 100 scientific papers and holds over 20 patents.

Packaging and hybridization, the valorization of MEMS technologies

Speaker: Michel Despont, CSEM SA, Neuchâtel

Abstract

The integration of microsystems and, in particular, of MEMS devices continues to be a key element of many high technology application areas. If the devices themselves are crucial elements for innovation, their integration in a complete microsystem are essential for their successful commercialization. Hence development of 3D integration and packaging technologies are of the upmost importance. At CSEM we develop new solutions for wafer level hybridization and packaging solutions to respond to the demand of the industry active in microsystem technology. An overview of the packaging and hybridization technology will be presented along with some concrete examples such are biocompatible hermetic packaging for active implant, wafer level gas cell for atomic clock, wafer level hybridization for complex micromechanical components, heterogeneous integration of microdevices at wafer level, MEMS integration on soft micromodule.

Biography

Dr. Michel Despont received a Ph.D. in physics from the Institute of Microtechnology, University of Neuchatel, Switzerland, in 1996. After a postdoctoral fellowship at the IBM Research - Zurich laboratory in 1996, he spent one year as a visiting scientist at the Seiko Instrument Research Laboratory in Japan. In 2005, he was appointed manager and led the nanofabrication group at IBM Research – Zurich Laboratory. Since 2013, Dr Despont is currently employed by the Swiss Centre of Electronics and Microtechnology (CSEM) as Vice-President of the MEMS program and manager of the Emerging Micro&Nano Technologies section in the Micro&Nano Systems division.

Triaxis, a 3D magnetometer which contributed to the success of Melexis, might help solve the last remaining challenge in robotics: human-like manipulation

Speaker: Théo Le Signor, Melexis, Bevaix

Abstract

The Hall effect is a well-known phenomenon that can measure a normal magnetic field in conductive materials. Triaxis® is a concept which combines Hall elements with a thin ferromagnetic layer that allows for a 3D magnetic sensing. It was conceived at EPFL in the beginning of the 2000s, developed in a spin-off and industrialized 20 years ago by Melexis. After explaining how the sensor is made we will see how it is industrialized so now nearly 3 billion pieces have been produced. Last, we will look at the future of 3D Hall effect sensors, incubating in Melexis, including enabling tactile sensing to give a sense of touch to robots.

Biography

Théo Le Signor studied physics at École polytechnique and holds an engineering degree from EPFL in electronics. He joined Melexis's innovation lab as a Sensor design engineer in 2021. He works on developing new sensing concepts for the robotics industry. His research focuses on the use of hyperelastic materials to measure forces and the impact of tactile sensing for dexterous robotic manipulation.