Technological Application Fields for MEMS Sensors and Actuators

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Abstract:

According to the outcomes of the High Level Group on Key Enabling Technologies (KETs), the main leverage to the development of next innovative goods and services will be based onto nanotechnology and nanoelectronics, including semiconductors. The mastering of those technologies will lead to play an exclusive role in R&D, innovation, hi-tech ecosystems, and cluster strategies of many industries.

STMicroelectronics is among the European leading centers of excellence on “More Than Moore” technology identified by the High Level Group on KETs.

MEMS developed technology capability generated during past years innovation and fueled a new generation of smart sensors and actuators quite often utilized in Consumer and Healthcare applications such as body area sensors and remote monitoring. Beyond the MEMS market for Inertial Measure Units (accelerometers, gyroscopes and magnetometers), Micro-actuators and micro-sensors have been integrated on silicon based on piezoelectric thin-films, for applications like in Data Storage, Ink Jet, Health Care, Automotive and Energy Scavenging, ultrasound transducers, gesture recognition, echography, micro-pumping, healthcare, etc. In particular way Earth magnetic field sensors are used in consumer applications such as GPS positioning, indoor navigation and in the omni-comprehensive mobile smart phones.

At the same time to maintain the pace advanced packaging technologies and vertical interconnections for full 3D integration have been developed with quite innovative solutions, included the through mold or Si Via and flip chips. Last but not least also the MEMS substrates had a fast evolutions in terms of SOI wafer fabrication, total thickness variation and pattering with cavity.

A particular and emerging role on the other side is assumed by Micro-Opto-electro-Mechanical-Systems (MOEMS) which introduce new application fields and technological challenges to reduce space, cost and power supply.

The proposed session will focus on a next-generation of MOEMS technologies and devices, global trends in the MOEMS fields, future applications, device processes, design, methodology and manufacturing. In this frame the Lab4MEMS-II project was established (http://www.lab4mems2.ite.waw.pl/). The project is an ENIAC Joint Undertaking involving 18 industrial, research and academic partners under the lead of STMicroelectronics with the goal to setup of a pilot line for innovative MOEMS.

Lab4MEMS-II focuses on the development, test and validation of micro-mirror based devices such as pico-projectors, 3D infrared scanners and near-infrared micro-spectrometers. The project new findings will pave the way to the worldwide commercialization of contactless commanding of devices, holographic imaging and smart driving.

The diffusion of MOEMS will produce another breakthrough in the consumer market with their applications on portable and wearable electronics, where optical features can become of common use and also gas detection with NIR spectrometer. The involved integration materials require new approaches towards applicative optical study vs. radiation wavelength, reflectance, performances and reliability, whereas actuation will concern the definition and choice of the most suitable among electrostatic, electromagnetic and piezo-electric modes.

Presenter:

Luca Zanotti graduated in Physics, Solid State address, from Milan State University in 1988, when he joined STMicroelectronics (SGS-Thomson at that time), Agrate Brianza. After covering a role as responsible of the teams for the development of CVD dielectric materials and Wafer Finishing for Non-Volatile Memories, he moved to Analog and MEMS Group for process integration and now he is in charge for Funded Project Management within the same organization. He is co-author of several papers concerning dielectric thin film properties and characterization in silicon planar technology and of international patents.