

COMLAB

Alex Dommann

CSEM develops, produces and integrates custom or standard innovative microsystems (sensors, actuators and their integration into micro-systems) by exploiting its advanced technologies to provide new integrated solutions to industrial and institutional customers. Targeted markets and applications include automotive, telecommunications, security, health care, biotechnology and environment – markets in which system miniaturization and integration is a must.

In close collaboration with the regional industry, research organizations, universities and the political authorities, the market for small volume production has been selected. Since the region between Lausanne and Neuchatel is already home to a substantial, successful MEMS cluster and CSEM has a rich portfolio of MEMS solutions to offer, it was obvious to increase the Comlab activities.

The global objective of Comlab is to supply a technology support for the R&D and production projects of CSEM, IMT (University of Neuchatel) and other publically funded R&D laboratories in the field of micro- and nanosystems like the CMI at the EPFL in Lausanne.

CSEM concentrates its cleanroom activities towards reliable and qualified processes rather than developing absolute unique processes. Thus, CSEM is complementary to the CMI and IMT environment and also plays a role as an industrial company.

Within the Subprogram **“Foundry Services”**, the Comlab organized the processing of the structures within the different programs of the divisions. Applications were minimal invasive medical instruments, MEMS for space, watch parts, fluidic channels and many other structures needed for evaluating the possibilities of the technology. The laboratory also fabricates prototypes and demonstrators that are used in advanced R&D programs of the industry. The flexibility of Comlab for the fabrication of small quantities of prototypes has proven to be attractive to industry for their R&D programs. To improve the power and the reliability of the foundry services, a quality manager with industrial experiences was hired.

Within the Subprogram **“Process Development”** the Comlab developed new processes needed in research programmes as well as for the small volume production.

The Subprogram **“Quality Control”** is focusing on a key issue for the industrialization of MEMS. Quality control, however, needs attention at every development step. Reliability, testability as well as aging are key words which are essential to the industrialization of MEMS. CSEM, in collaboration with IMT (group of Prof. N.F. de Rooij) has moved one step further to industrialization by combining the service of the Micro- and Nanoscopy (SMN, Dr. Massoud Dadras from IMT) with an additional X-ray service headed by Dr. Antonia Neels to a true quality management lab. Quality control is one way to differentiate CSEM from the Universities. 249 samples were measured and analyzed by the new X-ray

service during the year 2007 and 321 structure analyses were carried out. The X-ray service was engaged in different applications for European Projects and projects on long term stability/aging of MEMS by HR-XRD.

The goal of the X-ray Diffraction Laboratory for MEMS is to develop a test procedure for MEMS devices that:

- Produce data that will help the system designers understanding of ‘end-of-life’ characteristics
- Can be adapted to the failure modes of MEMS devices. Can help to find correlation of the defect analysis with mechanical properties for Si based micro systems.
- Life time estimations of specific Si based devices under different environmental conditions.
- To develop a quality control tool based on X-ray defect analysis.

HRXRD measures the strain of a crystal with high resolution. This non destructive method obtains quantitative data on the strain present in a sample. CSEM uses HRXRD to assess the strain in DRIE etched processed silicon beams. Strain deforms the silicon beam leading to an appreciable sample curvature which is detected via the broadening of the X-ray peak in a “rocking-curve” measurement.

In the future the collaboration between IMT and EPFL will be enforced.

