LIS

Laboratoire d'ingé
des systèmes de Vers

PRESENTATION INSTRUMENTATION AND MODELLING OF ADVANCED SYSTEMS AND NANO-SYSTEMS

The movie team

The IAS (Instrumentation of Advanced Systems and nanosystems) team is structured around the question of characterizing the behaviour of the so-called **advanced systems** (or, systems that combine electronics, optics, mechanics and control, and that fulfils complex tasks). The characterization is composed of various steps : modeling the behaviour of components in order to apprehend the role of environmental parameters, and then the instrumentation and metrology of the component or the entire system to approve its performance.

The **Pre-Characterization** includes:

» The modeling of physical and behavioural phenomena, both at the component level of a system and at the functional level of the system itself.

» The modeling, often multi-physics and multi-scale, that allows to understand the component integration or sub-functions to optimize performance and reliability.

» The search for new measurement principles that enables to apprehend behaviours, coupling phenomena or phenomena with very different order of magnitude between the component and the system.

The **Post-Characterization** allows:

» To study the impact of the design on the system performance, its reliability, sturdiness and dynamic or “real time” behaviour.

» To study the intrinsic performance of the system from a metrological point of view by a controlled measurement chain.

» To consider and optimize interactions and communication between components and sub-functions.

» To optimize in fine a so-called “advanced” efficient system.

The specificities we chose to emphasize within IAS are based on :

» “Multi-scale” systems, that is to say macro-systems with design bricks (either components or sub-functions) at dimensional scales much smaller than the complete system (typically studies of functions at the nanoscale on centimetric systems).

» “Multi-physics” systems, essentially for the pre-characterization, that is to say when the understanding of behaviours requires the coupling modeling between different physical phenomena (thermics, mechanical, electrical mainly).

These problems go through a great complementarity of skills and a wide disciplinary field which explains the various specialties of the team's members. The team gathers specialists in component behaviour modeling or multi-physical phenomena for afterwards research but also specialists in instrumentation for the beforehand research. We specify here the term **instrumentation, sometimes generic term,** as the mastery of the design of a measurement chain from the sensor physics to data processing in the embedded system or the transmission of those data on a communication network.