Main Goals

The proposed detector parameters are at least one to two orders of magnitude more advanced than those found in the literature. The proposed imager design techniques will enable the elimination of scanning in fluorescence analysis thus increasing the achievable frame rate at a given resolution by three orders of magnitude. In addition, the demonstration of the fill-factor recovery concept will enable a host of additional on-board pixel-processing applications until now precluded by area-related issues.

These achievements will allow breakthroughs not only in imaging but also in multi-processing architecture, flow-control engineering as well as biology and bio-medical sciences. The project aims at establishing a new record in sustained frame rates and ultra-high timing accuracy for imaging systems over a kilopixel. European excellence in this field will be re-established, thus paving the way to the emergence of a new class of low-cost, high-quality imagers. Applications in medical, bio- and neuroscience, and other industrial fields will be the prime candidates to exploit the new imaging technology.
Partners' Roles
- EPFL: The Quantum Architecture Group (AQUA) will lead the design of high speed SPDs where it has extensive experience. The group has designed and fabricated SPADs in a number of CMOS technologies. It has also designed advanced RISC processors and it is currently involved in the design of ultra-low-power multi-processors based on multi-RISC architectures.
- UNIPV: Will be committed to the problem of recovering the fill-factor through a special optical element, to be designed and implemented as a separate activity parallel to the chip fabrication. The Group has a long standing reputation internationally on photodetectors and especially optics thereof.
- UNIED: UNIED is the conjunction of IMNS, which will lead the activity on system modelling and processing for biological signal detection, and COSMIC, which will lead the laboratory evaluation of the imager and SPAD prototypes and will devise experiments demonstrating its unique detection capabilities for a range of biological systems including single-cells and complex macromolecules. Both groups will collaborate in the production of a laboratory microscopy demonstrator.
- FBK: The main role of FBK (formerly ITC) will be to design and test on-chip analogue electronics required by the high-speed imaging system. In particular FBK will design dedicated analogue pixel structures to be implemented in the first prototype sensors, and the main filtering blocks aimed at fixed-pattern noise reduction, analogue-to-digital conversion, calibration procedures and on-chip bias generation.
- STMICRO: STMICRO will provide access to semiconductor fabrication in state-of-the-art CMOS technology and contribute process expertise supporting development of the SPAD device. Using its experience in development of highly integrated imagers STMICRO will assure the tape-out of functional, manufacturable imager chips. STMICRO will propose an exploitation plan for practical, miniaturised imaging systems resulting from the prototype chips, particularly for diagnostic, point-of-care applications.