Dynamic molecular interactions study in living cells, by n-dimensional fluorescence measurements.

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To study protein-complexes dynamic formation and dissociation we use timelapse multipoint FRET (Forster Resonance Energy Transfer) measurements in living cell, by the way of multidimensional fluorescence acquisitions. For example, we used lifetime and spectral measurements of tagged proteins to investigate interactions occurrences. However, in aim to analyze protein/proteins or protein/NA (nucleic Acids) interactions by n-dimensional fluorescence measurements (spectrum, lifetime, FRET, anisotropy,..) we have developed one software, called “Archimedes”, which allows us to drive simultaneously the Confocal SP2 and Becker TCSPC (Time Correlated Single Photon Counting).

This software can now drive the Confocal Leica SP2 by COM/FPGA (Field Programmable Gate Arrays) technology (figure 1) and the SPC730 Becker Card by low level orders. Archimedes can make FLIM (Fluorescence Lifetime Imaging Microscopy) by MCP (Multichannel Plate) acquisitions in time, by real time remote communication with Archimedes (figure 2). Archimedes software is LCS (Leica Confocal Software) compatible and was developed to be user friendly for biologists. Written in C/C++ language, Archimedes was developed to be adaptable to new hardware developments by “Plug and Play” hardware communication software.

By the means of archimedes software we can introduce new intrusmental studies. At this time, one module in Archimedes is developed to introduce the FCS (Fluoresence Correlation Spectroscopy) with our FLIM/MCP knowledge.