Voice: We present here a light sheet microscopy setup in current development on the Curie Institute Imaging Facility (PICT-IBiSA).

Our instrumental setup is optimized for fast multicolor (4 laser lines from 405 to 638 nm, 2 cameras) 3D imaging. Careful choice of optical components reduces chromatic aberrations and the use of double illumination excitation path improves image quality and acquisition speed.

Light sheet is shaped using two cylindrical lenses and two excitation objectives 10X NA 0.3. We will use a variable optical zoom system with fast electrically tunable lens, which allows adjusting the size of the light sheet. This is well adapted to various sample sizes and to samples that can grow in size over time, like 3D cell cultures (spheroids) or embryos.

To image large samples, we have designed a new incubation chamber which allows to make a quick assembly on any type of objective using 3D printing technology. Moreover, it allows a fine control of the temperature and CO2 concentration and is easy to maintain.

Fluorescence is collected by a water-dipping objective (16X NA 0.8 or 40X NA 0.8) and detected simultaneously on two channels (with 2 sCMOS cameras) detection path. Fast filter wheels on both detection arms allow for fast 4-color imaging. We use two sCMOS (Hamamatsu Flash 4) camera fast-linked to a high-speed storage PC (SSD hard drives) for high-speed and high spatial resolution acquisitions.

Since one of our main goals is to make the whole system easy to handle and reliable, the whole system will be driven by a user-friendly software based on Metamorph, and will integrate accurate image processing algorithms.

Last but not least, dynamic imaging in SPIM produces large data sets to handle and multiple detection channels require accurate 3D reconstruction and image optimization software. Our project will benefit of the new Image Database (iManage) infrastructure that is being build up in close partnership with Strand Avadis as well as of the expertise in bioimaging informatics from both Curie Institute and Inria-Rennes (Serpico’s team).

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