Quantitative imaging and the benefits of the OPTiSPIM approach to mesoscopic imaging

Jürgen Mayer\textsuperscript{1,2}, Jim Swoger\textsuperscript{1,2} & James Sharpe\textsuperscript{1,2,3}

\textsuperscript{1}Systems Biology Program, Centre for Genomic Regulation (CRG), Dr. Aiguader 88, 08003 Barcelona, Spain
\textsuperscript{2}Universitat Pompeu Fabra (UPF), Barcelona, Spain
\textsuperscript{3}Institució Catalana de Recerca i Estudis Avançats (ICREA), Pg. Lluis Companys 23, 08010 Barcelona, Spain

\textit{Mail: juergen.mayer@crg.es}

Light-sheet based microscopies (e.g. SPIM) and Optical Projection Tomography (OPT) are both technologies that can be applied to the 3D imaging of samples up to the centimetre range (mesoscopic imaging). Light sheet based approaches can achieve high resolution in large samples by 3D data stitching, but are limited to fluorescent contrast. Optical projection tomography works with fluorescent and non-fluorescent contrasts, but its resolution is limited in large samples. The recent development of a hybrid setup (OPTiSPIM) combines the advantages of each technique. However, the hybrid setup does not only allow for a more extensive representation of mesoscopic biological samples by combining fluorescent and non-fluorescent 3D data in integrated datasets \cite{Mayer2014}. The main advantage of having OPT incorporated in a light-sheet microscopy setup originates in quantitative imaging. Transmission OPT delivers quantitative measurements of the 3D distribution of attenuation in the sample. These quantitative measurements enable calculations to correct the fluorescent signal of the light-sheet based scan for attenuation by the sample. We will present our results and explain the tools we are using to achieve them.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{Principle_Geometries.png}
\caption{Principle Geometries}
\end{figure}