The benchtop mesoSPIM - a compact and versatile open-source light-sheet microscope for imaging large cleared tissue samples

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Abstract Text

Recently, we launched the mesoSPIM initiative (www.mesospim.org), an open-source project aimed at making light-sheet microscopes for imaging large (cm-sized) cleared tissue samples more accessible (Voigt et al., Nature Methods 2019). Here, we introduce the benchtop mesoSPIM, a more compact and cost-efficient version of the instrument which requires a budget of less than 100 k€ to build. Similar to the original mesoSPIM, the benchtop version utilizes an axially swept light-sheet to achieve near-isotropic resolution across a field of view up to 30 mm. With a travel range of $50 \times 50 \times 100$ mm³ and a rotation stage, the instrument is capable of multi-view imaging of entire cleared mice. It is compatible with all clearing techniques and can image an entire mouse brain within 10 minutes at sub-cellular resolution. The microscope utilizes the same data acquisition software as the published instrument (github.com/mesoSPIM). We provide several application examples including screening APP/PS-1 mouse brains processed using the

iDISCO protocol and imaging human cortex samples processed with an iDISCO/ECI/MASH protocol. The benchtop mesoSPIM is an attractive option for research groups and imaging facilities seeking a compact high-performance light-sheet microscope for cleared samples that can be adapted to a wide range of applications.