# PSI | PHYSICAL SCIENCES

MULTI-MODAL ADAPTIVE OPTICS RETINAL IMAGER (MAORI)

The multi-channel adaptive-optics retinal imager (MAORI) is a new tool for researchers and clinicians to investigate and monitor changes of retinal microstructures due to disease progression or response to treatment. MAORI is ideally suited to the fundamental research essential for early detection, diagnosis, and quantification of retinal complications in type 1 diabetes (T1D) and other retinal diseases. Visualization of micro-aneurisms, pericytes, temporal and spatial evolution of microvasculature (capillary remodeling and reperfusion), as well as axonal changes is possible using so-called "offset aperture" and "split-detector" approaches in AO-based scanning laser ophthalmoscopy (AO-SLO).
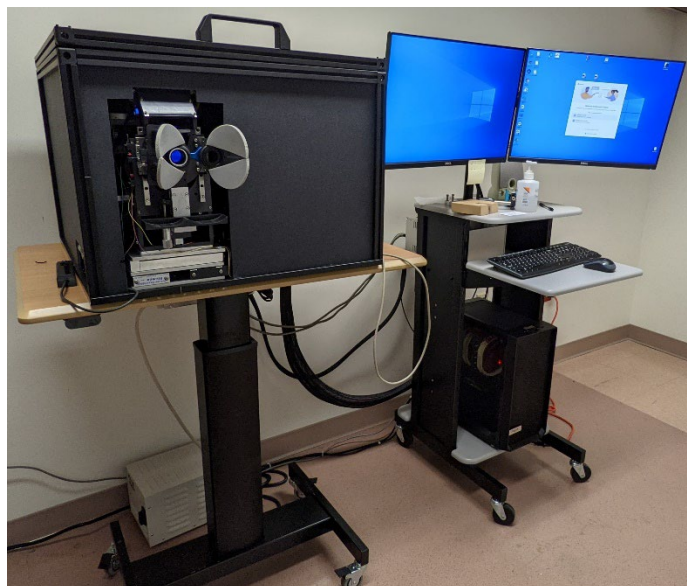
INSTRUMENT CAPABILITIES

➢ Exploration of the fine cellular and lamellar retinal structure with near-isotropic micron-level resolution
➢ AO-SLO simultaneous confocal and four offset apertures (fiber bundle)
➢ AO-OCT B-scans or C-scans
➢ Live four offset aperture or four simultaneous split-detector imaging directions for isotropic imaging
➢ Visualization of retinal capillary networks using the motion of blood cells as contrast mechanism – no contrast agent needed
➢ Imaging of larger blood vessels to measure their diameter and their wall thickness and to visualize the fine structure of vessels walls - not possible with standard AO-SLO imagers or any other imaging modality
➢ Software-controlled axial position of the focal plane within retina assisted by the simultaneous OCT B-scan
➢ Trial lenses for extended range of spherical correction
➢ Post-processing package that provides alignment of stacks of images from the five channels, average and standard deviation images, split-detection analysis, phase and phase-gradient images, movies showing the blood flow dynamics.

OPTICAL DESIGN PARAMETERS

- Standard image dimensions: 640 x 640 pixels
- Max pupil diameter: 6.7 mm
- Estimated resolution: ~2.5 µm
- Nominal field size: 1÷5°(user selectable)
- Field of view: 20°x30° (fixation)
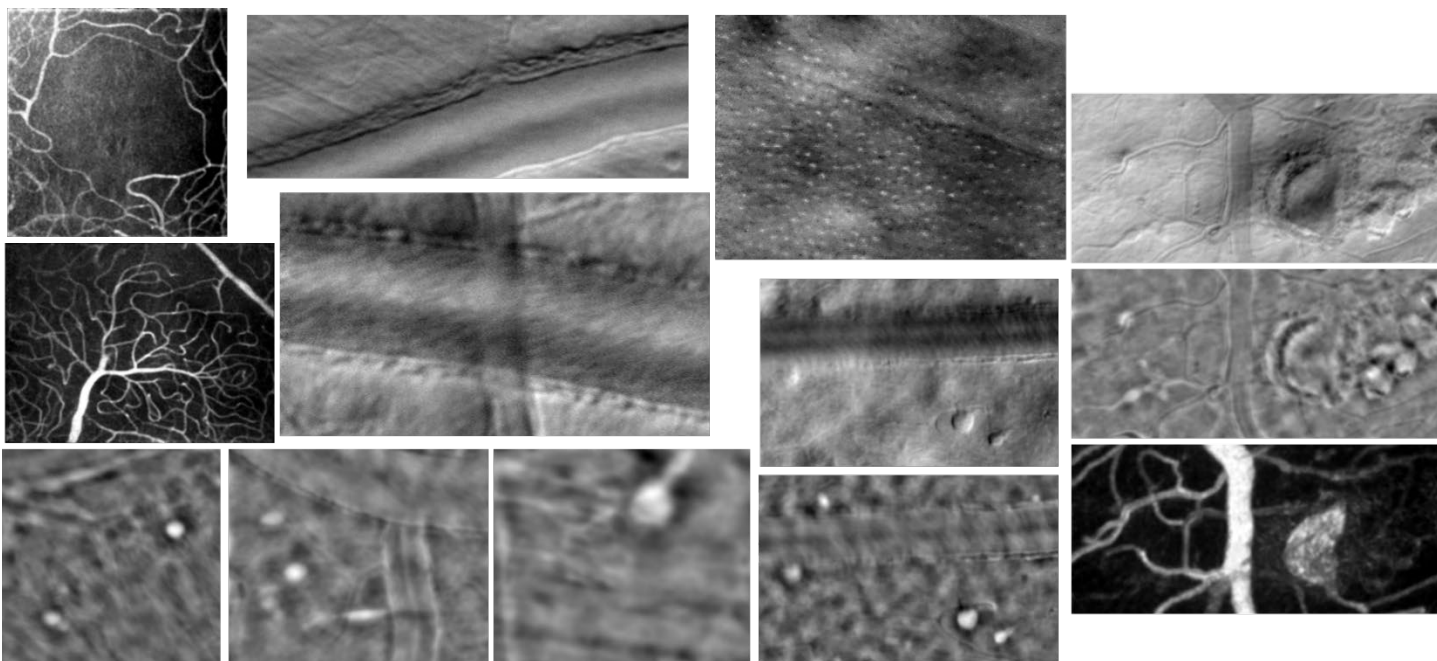- Frame rates up to 40 Hz
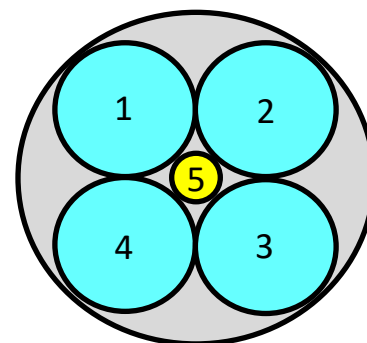
Fiber bundle detection arrangement.

COMPONENTS/FEATURES

- ALPAO DM-69
- X-Y galvo scanners raster/line scans and automated montage
- Integrated USB point-spread function (PSF) camera for AO calibration/image quality estimation.
- Complete GUI software package for AO control, image acquisition, and user interface.

EXAMPLE IMAGES

Example of images: capillary networks through motion contrast, vessel wall structure (mural cells, endothelial cells, perycites) and other microstructures like microglia, aneurisms, lipid deposits, scar tissue, exudates, thrombus, clotted aneurisms, and ganglion cells.

CONTACTS/INFORMATION

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