

**LOOKING DEEP  
INTO THE EYE**

Hamamatsu Photonics LCOS-SLM allows **imaging of retinal blood vessels** with a resolution previously unknown.

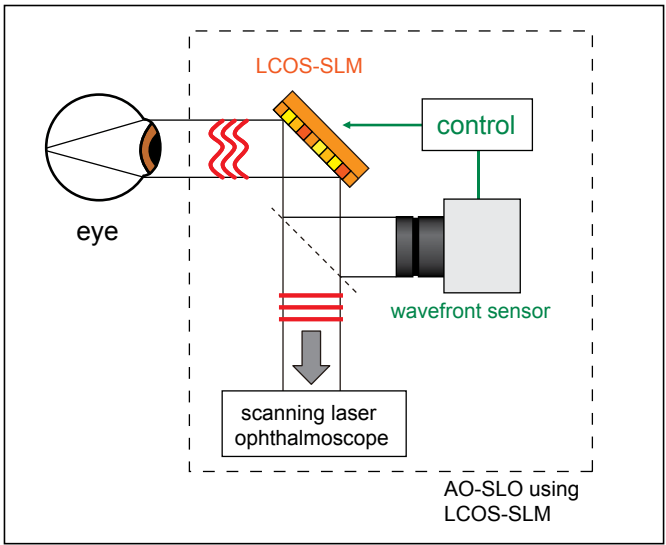
The eye is the only part of the human body where light passes, offering a unique window. With an ophthalmoscope, it is possible to see the eye's fundus, including the visual receptor cells, retinal blood vessels, and ocular nerve fibers. Nowhere else is such non-invasive imaging possible.

Examination of these structures can be used for early diagnosis of debilitating eye diseases, like glaucoma. But imaging of the fundus has been blurred by optical aberration, especially as the irradiating light passes the cornea and the lens.

To decrease the aberration in retinal imaging, liquid crystal spatial light modulators, which control the phases of the light, have been studied. They work by adjusting the refractive index of the liquid crystal at each pixel. Hamamatsu Photonics device, the LCOS-SLM (Liquid Crystal on Silicon Spatial Light Modulator), is specially designed to increase light utilization efficiency and to improve the accuracy of phase control.

The device is easier to handle and uses a lower voltage drive than other wavefront modulators such as deformable mirrors. Most importantly, it shows high resolution. By using this device, a prototype of an AO-SLO (Adaptive Optics Scanning Laser Ophthalmoscope) using LCOS-SLM was developed. The prototype can even distinguish individual visual receptor cells.

Besides better diagnosis of eye diseases, the high resolution *in vivo* images of retinal blood vessels may also enable researchers to detect diseases of the circulatory system triggered by lifestyle factors, such as diabetic retinopathy and hypertensive retinopathy.



Hamamatsu Photonics' expertise with light has revealed an elegant solution to a complex problem.

Acknowledgements: The AO-SLO using LCOS-SLM were developed under a research project of the New Energy and Industrial Technology Development Organization (NEDO) of Japan. The AO-SLO is being examined with cooperation from NIDEK Co. Ltd. and the Faculty of Medicine at Kyoto University under this project.

For more information, visit our site at: <http://jp.hamamatsu.com/en/rd/publication>

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