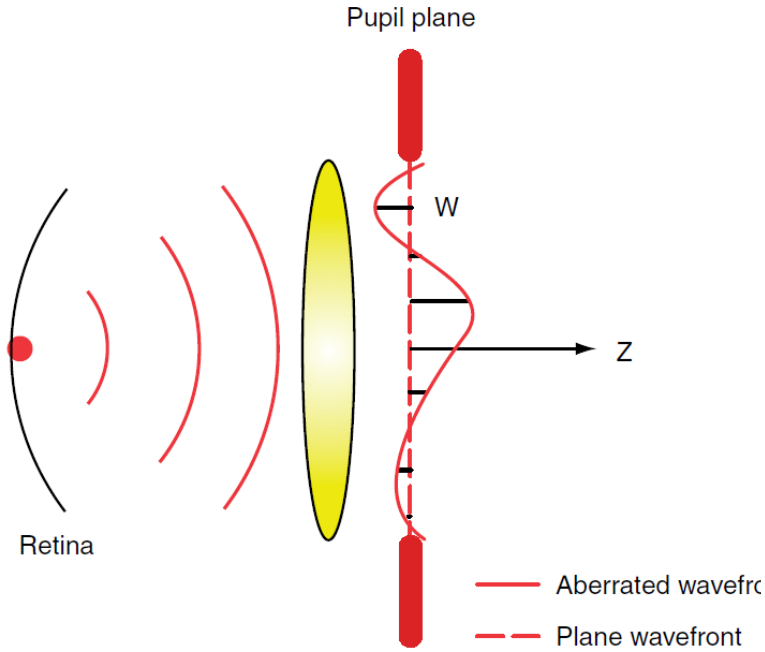
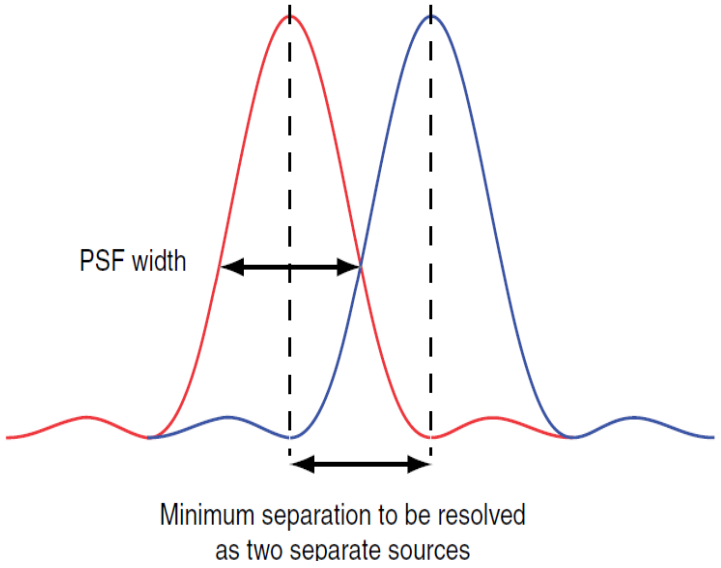
Digital holographic adaptive optics

- Motivation
- Principle of AO
- Conventional AO
- DHAO
- Results

Motivation





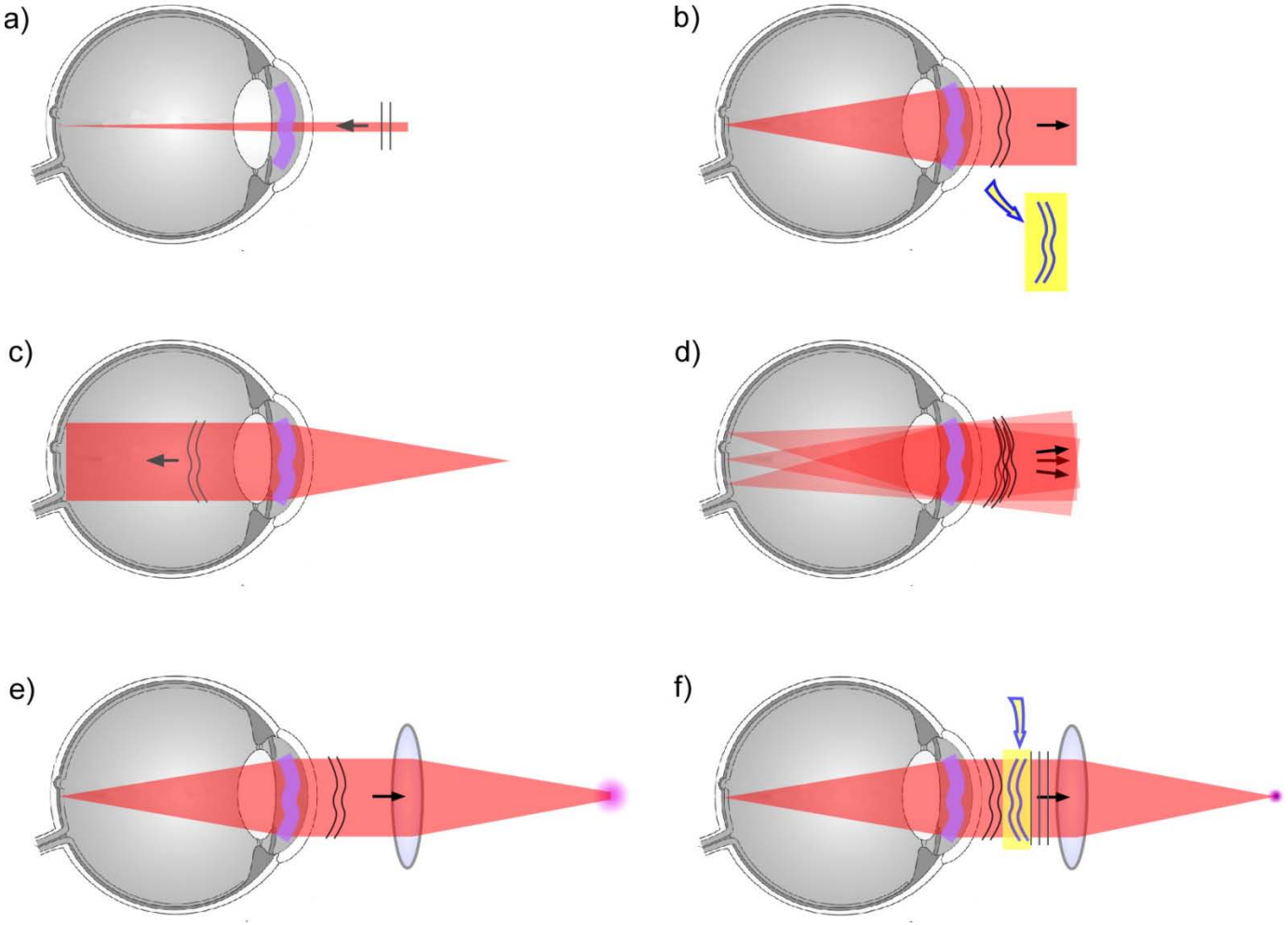
rms: $\sigma=[\Sigma(W-W_{ave})^2]^{1/2}/N$

Strehl ratio=$\exp[-(2\pi\sigma)^2]$

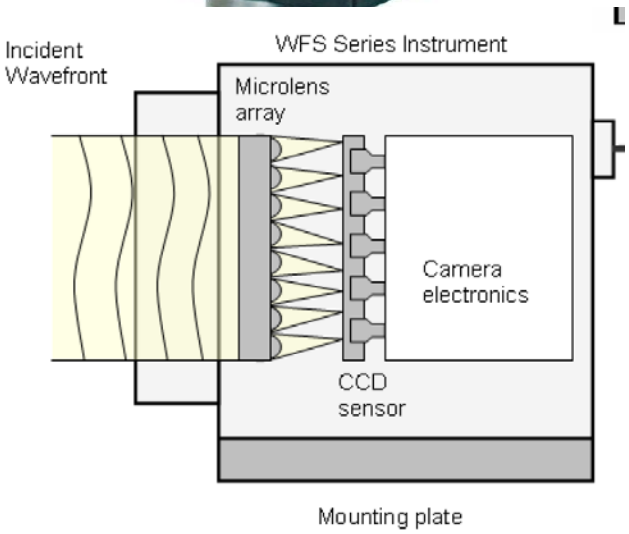
$$PSF_{\text{width}} = \frac{1.22\lambda f}{nD}$$

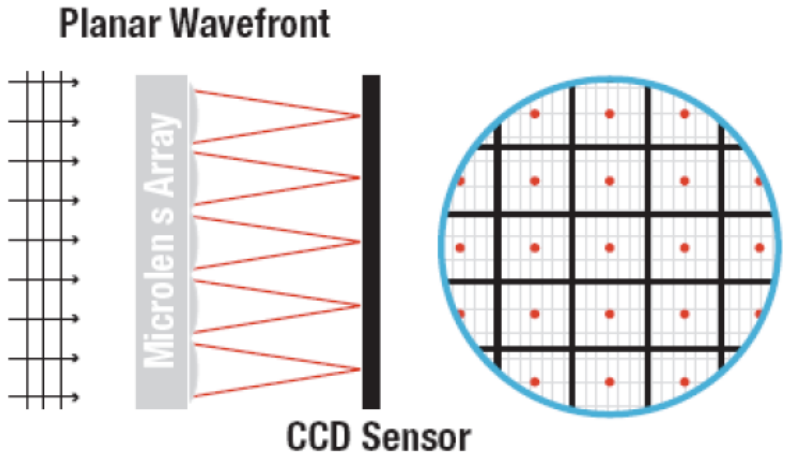
K.Hampson, 3425,JMO,55:3425(2008)

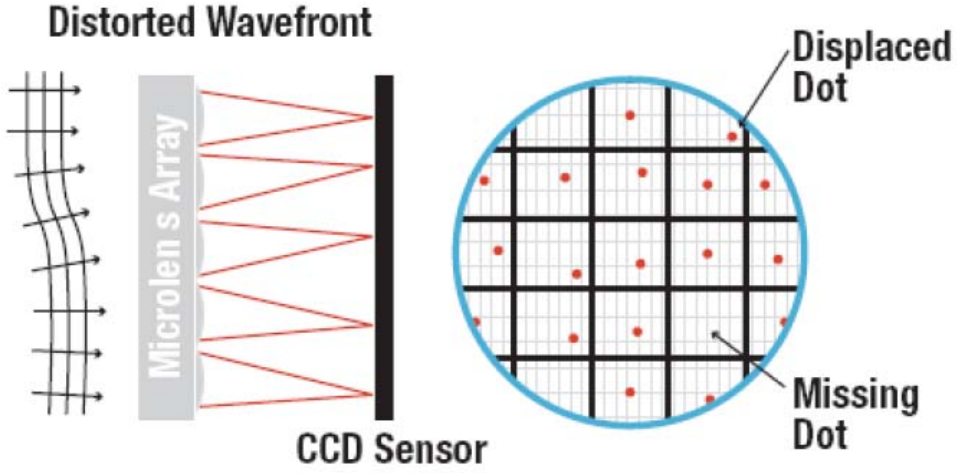
Principle of AO



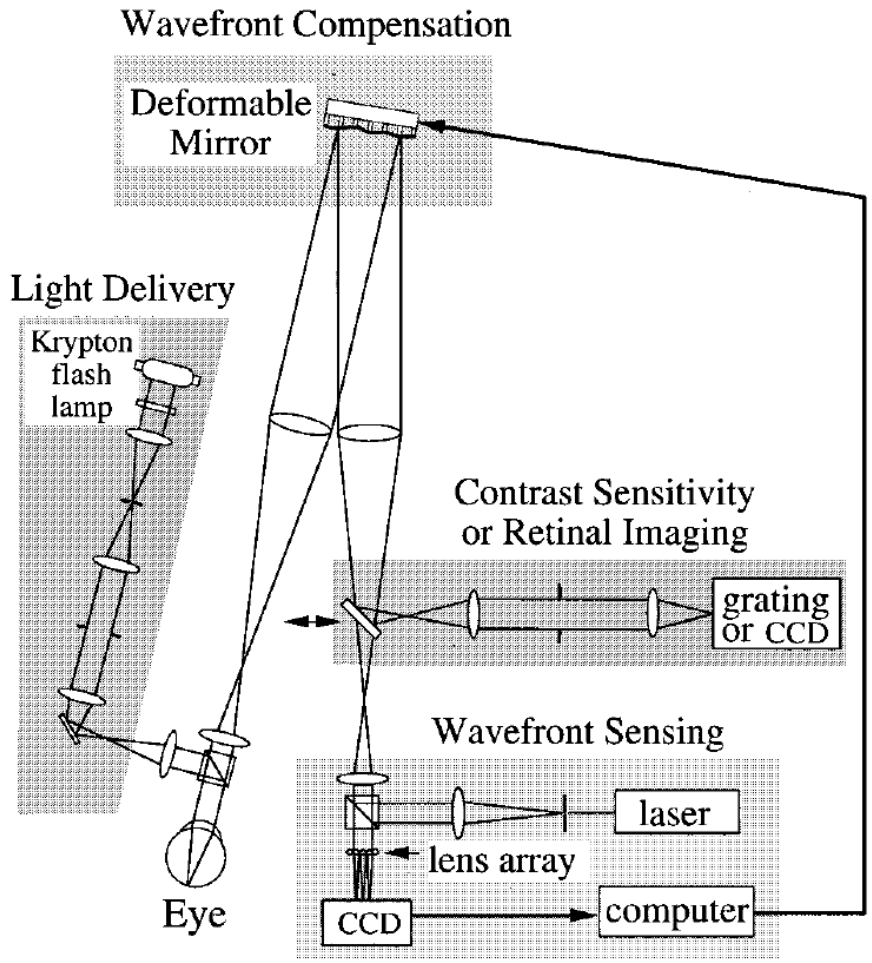
Hartman-Shack Wavefront sensor

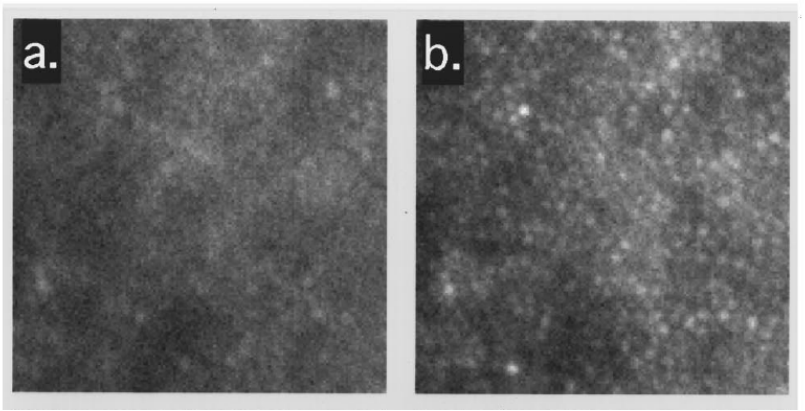






Traditional AO system

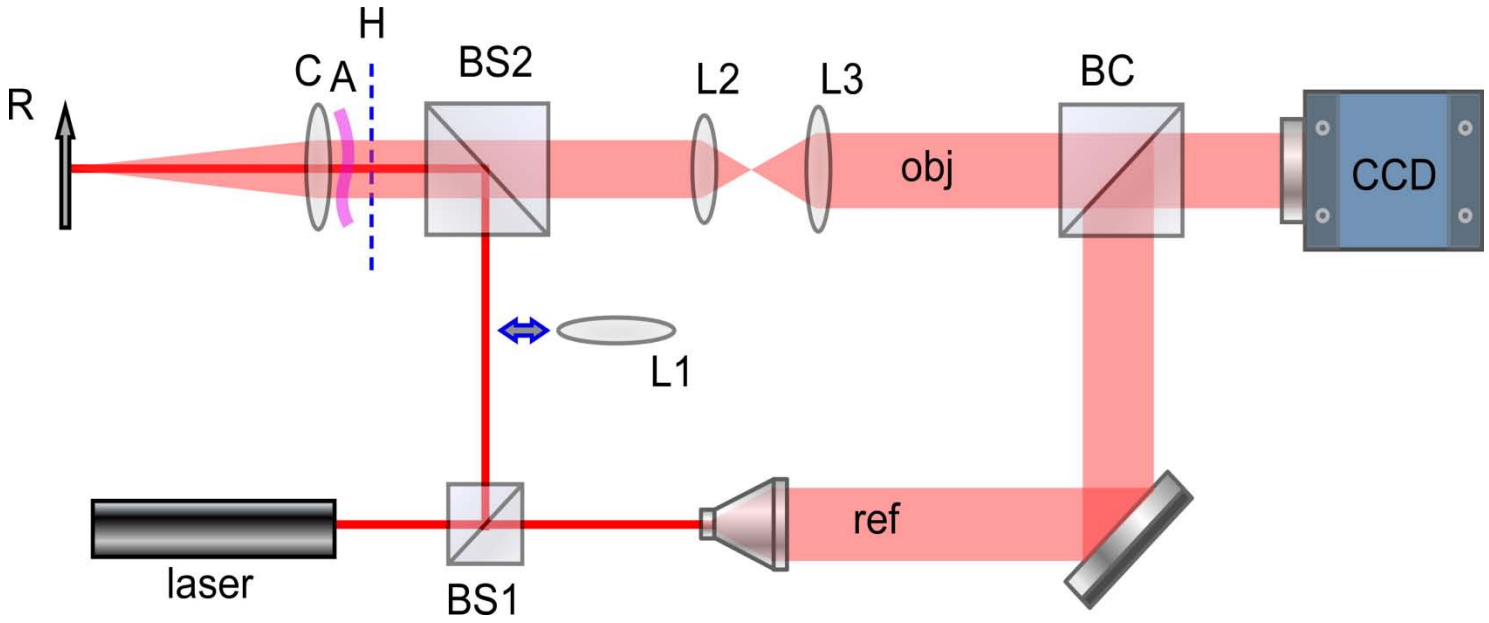




before compensation **after compensation**

J.Liang, et. al. JOSA, 14:2884(1997)

DHAO

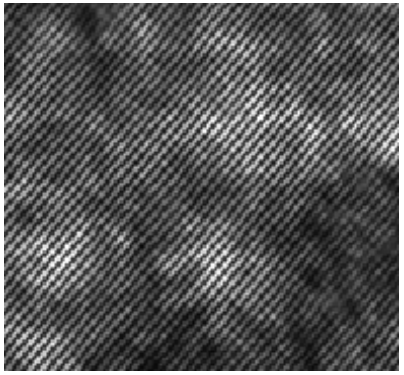


R:retina A:aberrator,
BS:Beamsplitter BC:Beam combiner

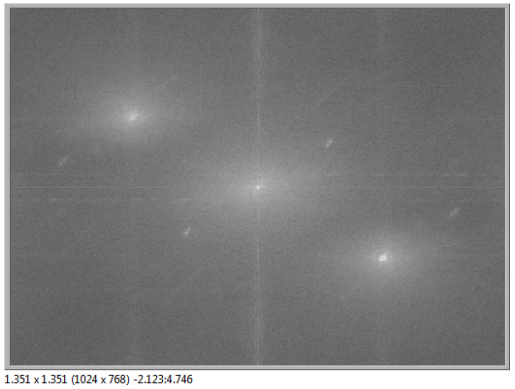
C. Liu and, M. K. Kim, Opt. Lett.,36:2710(2011)

Proof of the principle

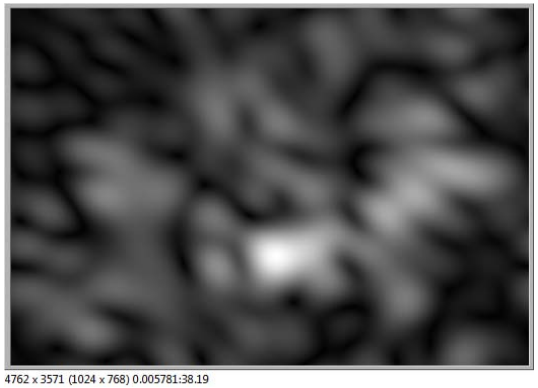
hologram: 4762μm×3571μm



detail of hologram

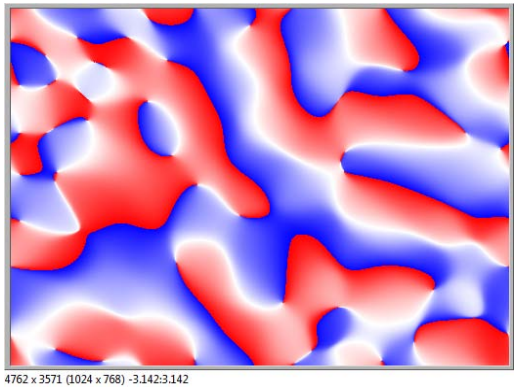


angular spectrum



amplitude

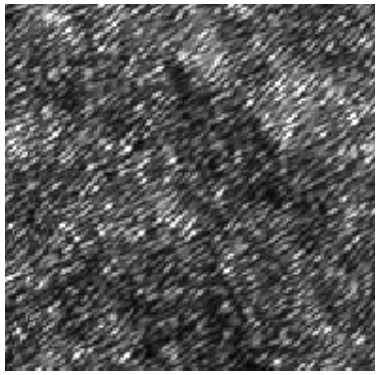
detail of amplitude



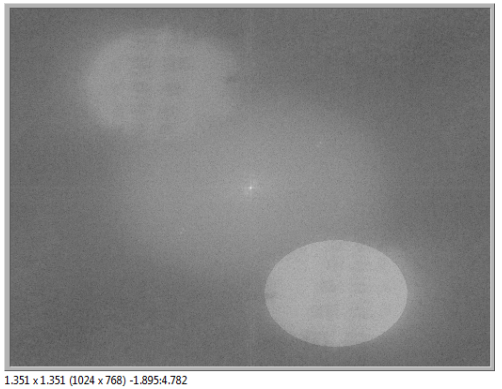
phase aberration

Proof of the principle

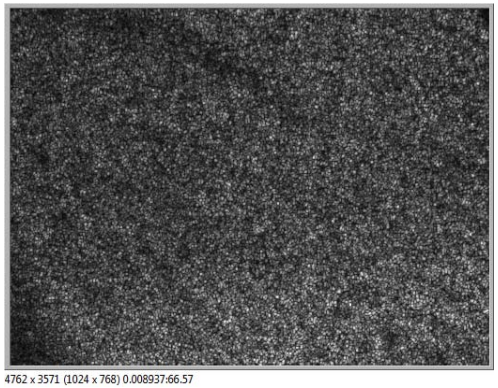
hologram: 4762μm×3571μm



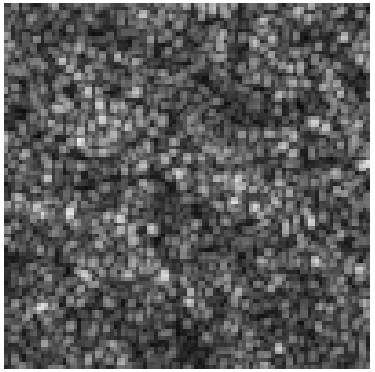
detail of hologram



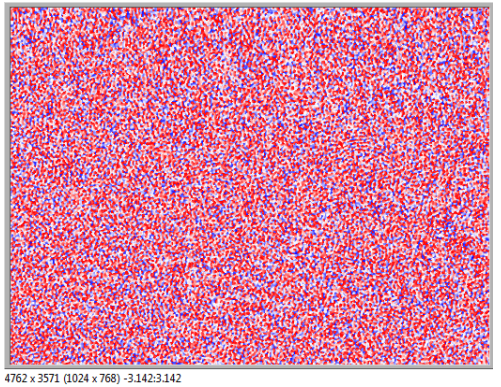
angular spectrum



amplitude



detail of amplitude



phase aberration

Proof of the principle

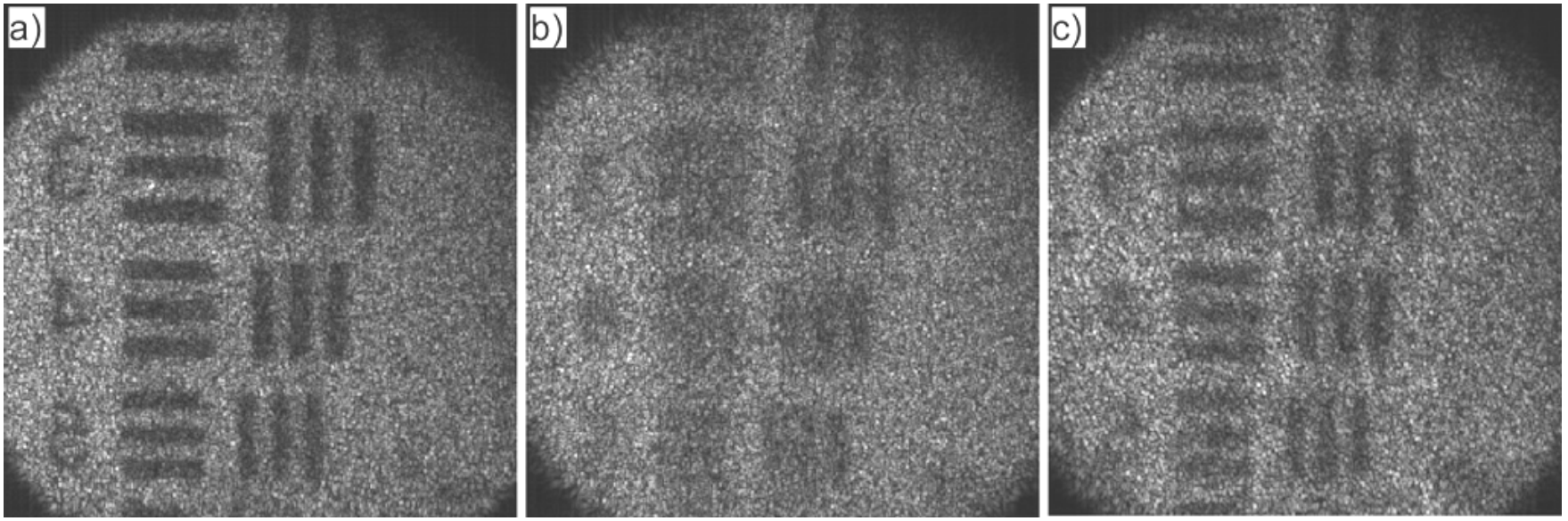
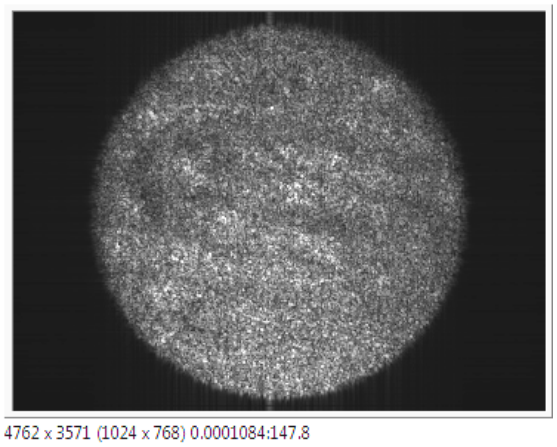


image without aberration **aberrated image** **Corrected image**

FOV: 2134μm×1601μm

Onion tissue



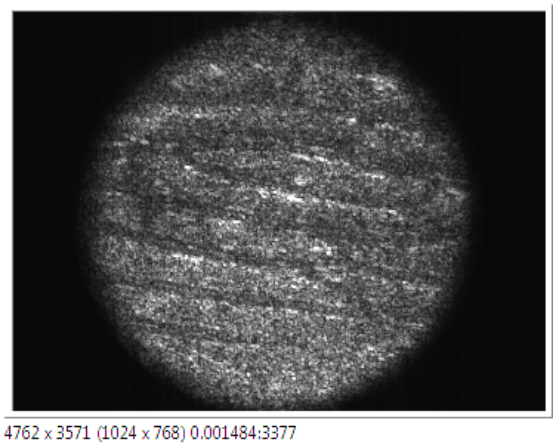


image without aberration

aberrated image

Corrected image

FOV: 990μm×714μm

Butterfly wing

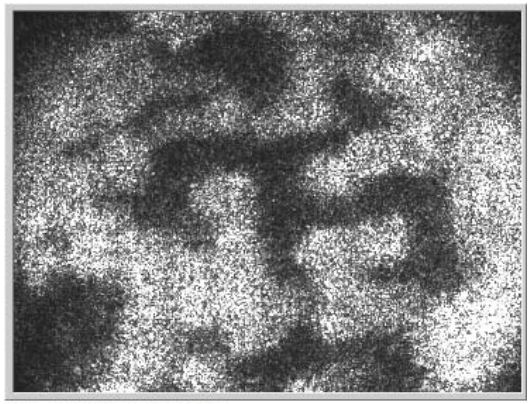
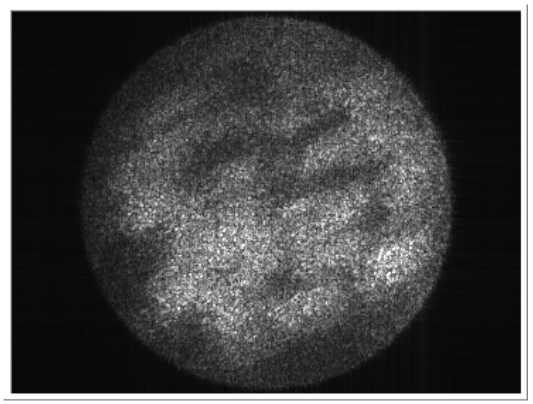
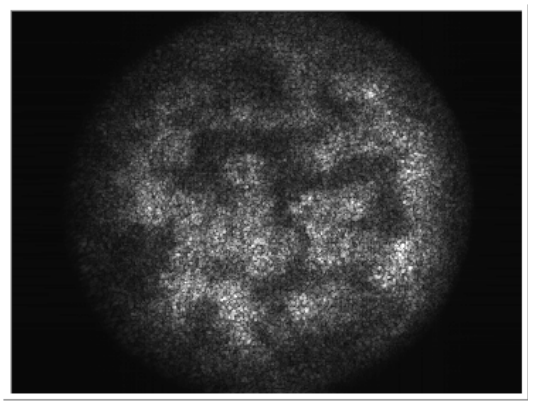


image without aberration



aberrated image



Corrected image

FOV: 990μm×714μm

DHAO on Cow eye's retina