

## Supplementary Information

# Adaptive Optical Two-photon Microscopy for Surface profiled Living Biological Specimens

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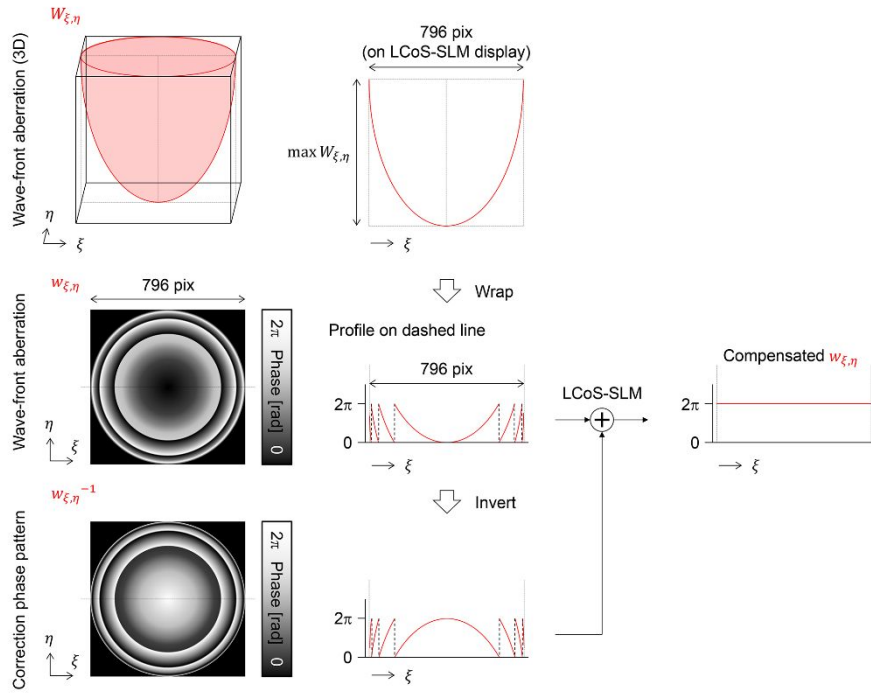


Figure S1 Schematic illustration of the compensation of wave-front aberration ( $W$ ). (top-left) A calculated wave-front aberration by the 3D ray-tracing method. (top-right) Phase profile on the dashed plane of (top-left). (center-left) 2D wrapped expression of  $W$ . (center-center) Phase profile on the dashed line of (center-left). (bottom-left) Correction phase pattern ( $W^{-1}$ ) obtained by inverting the spatial phase distributions of  $W$ . (bottom-center) Phase profile on the dashed line of (bottom-left). The phase is obtained from the inversion of (center-center). (center-right) The result of the compensation of the  $W$ .  $W$  is flattened by applying the correction phase pattern to the LCoS-SLM.

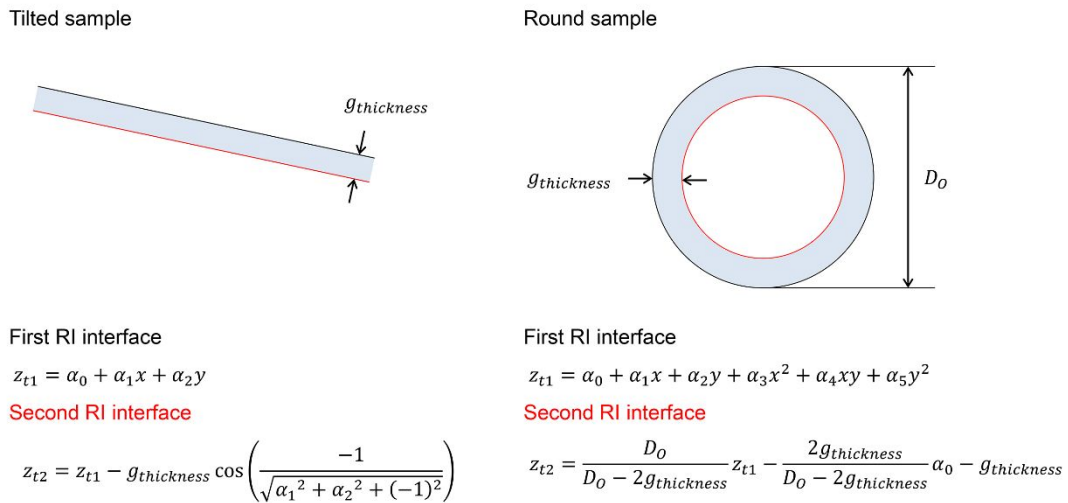


Figure S2. Estimation of the second RI interface in tilted or round samples.

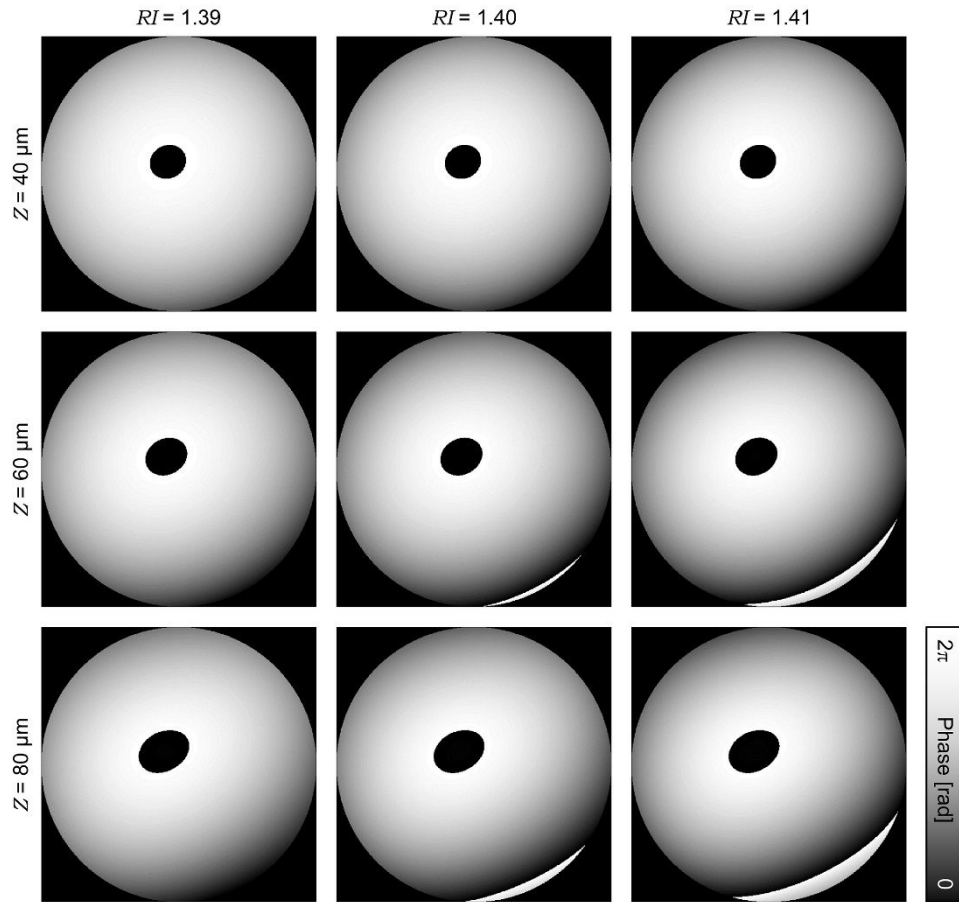


Figure S3. Calculated spatial phase distributions by changing the observation depths and the RI values of the MCTS. The distribution calculated with the RI value of 1.40 at  $60 \mu\text{m}$  depth was also represented in Figure 5b.

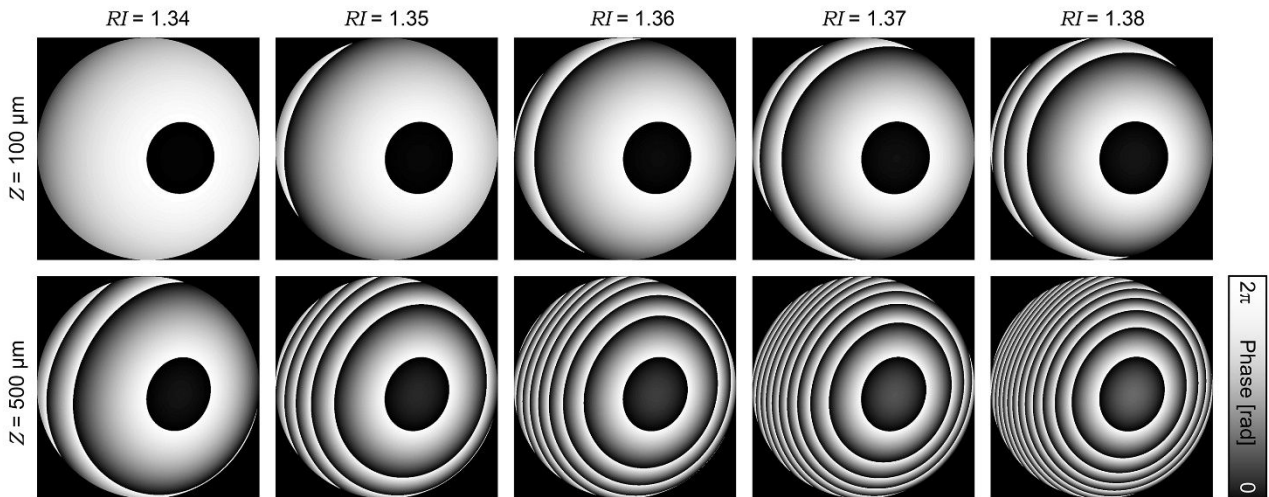


Figure S4. Calculated spatial phase distributions by changing the observation depths and the RI values of the mouse secondary motor cortex. The distribution calculated with the RI value of 1.35 at  $500 \mu\text{m}$  depth was also represented in Figure 6c.