

EFFICIENT WAVEFRONT SHAPING BY LIMITING ILLUMINATION NA THROUGH HIGHLY ANISOTROPIC SCATTERING MEDIA

Hyungwon Jin, Byungjae Hwang, and Jung-Hoon Park

Department of Biomedical Engineering, Ulsan National Institute of Science and Technology (UNIST), Ulsan, South Korea

E-mail: woyjin@unist.ac.kr, jh.park@unist.ac.kr

KEY WORDS: SLM, wavefront shaping, anisotropy factor, numerical aperture

Recent wavefront shaping made it possible to accomplish high resolution imaging through or inside deep living tissue by controlling the light field [1]. However, decorrelation time of biological tissue remain as a big limitation especially when using iterative feedback based algorithms because of long measurement times to get optimal correction of the output wavefront.

To overcome such limitations of wavefront shaping enhancement, here we propose efficient wavefront shaping through scattering media which has a high anisotropy factor like biological tissues [2] by simply limiting the numerical aperture (NA) of the incident wavefront. All other parameters are kept the same; same number of controlled modes are used and therefore the same wavefront measurement time is taken. Our method demonstrates a notable increase in both wavefront shaped focus peak to background ratio and energy delivery throughput by only limiting the incident NA.

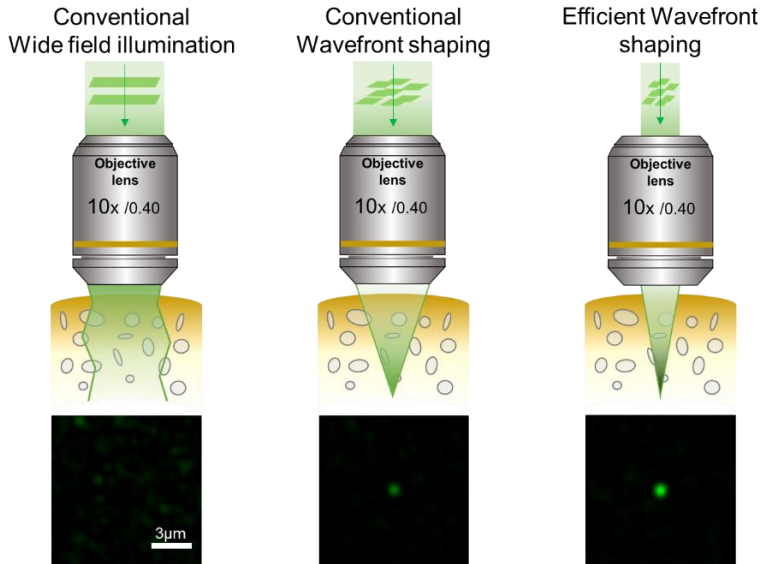


Fig. 1. Benefits of efficient wavefront shaping method by simply limiting incident NA for high peak to background ratio and energy throughput rather than using full illumination NA through high anisotropic scattering media.

[1] Vellekoop, Ivo M., and A. P. Mosk. "Focusing coherent light through opaque strongly scattering media." *Optics letters* 32.16 (2007).

[2] D. L. Andrews, *Photonics, Volume 4: Biomedical Photonics, Spectroscopy, and Microscopy* (John Wiley & Sons, 2015).