ANISOTROPIC FOCUSING BY CONTROLLING CONDENSER NUMERICAL APERTURE

Hyungwon Jin,[1] Byungjae Hwang,[2] Jung-Hoon Park,[1]

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

E-mail: woyjin@unist.ac.kr

KEY WORDS: SLM, wavefront shaping, multiple scattering, anisotropic factor, speckle pattern, intensity, PBR.

Focusing coherent light through multiple scattering media by spatial light modulator (SLM) make possible to overcome the limitation of complex aberration of light field [1]. Recent wavefront shaping technique achieves enough speed for aberration correction to follow and even over the decorrelation time of living biological sample [2]. However still, intensity and peak to background ratio (PBR) of focused light remain as critical issue.

Here we present a new option for established method of wavefront shaping by attention on scattering media. Most of wavefront correction experiments using opaque media, but actual biological sample has quite different properties. One of the major properties of bio-tissue is high anisotropic factor. This means most of light penetrate the bio-tissue as straight rather than scattered as wide angle. Figure1 show the difference of speckle pattern and diameter of scattered light according to controlled aperture size, when light penetrate the diffusive (Figure 1(A)) and sub-diffusive bio-tissue like sample (Figure 1(B)).

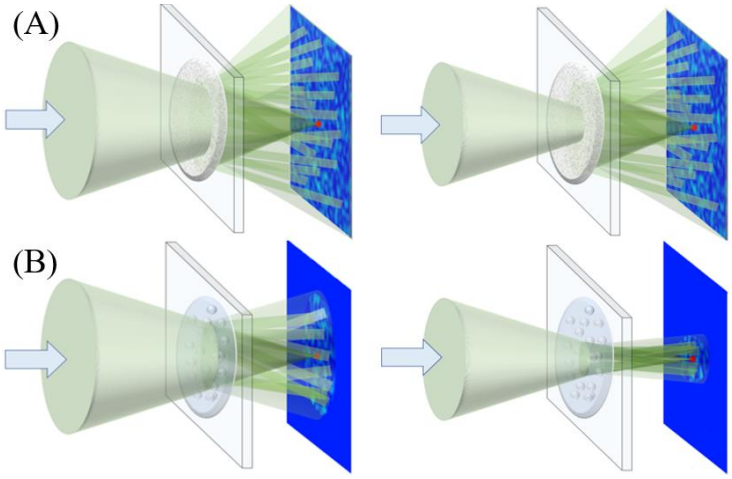

Figure 1: Scattering and focusing model with controlling numerical aperture of condenser lens at multiple scattering (A) and biological (B) sample.

[1] Vellekoop, Ivo M., and A. P. Mosk. "Focusing coherent light through opaque strongly scattering media." Optics letters 32.16 (2007).
[2] Liu, Yan, et al. "Focusing light inside dynamic scattering media with millisecond digital optical phase conjugation." Optica 4.2 (2017).