

Ballistic Photon Imaging in Light Scattering Media and Biotissues

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Optical microscopy is limited to shallow interrogation depths as high-resolution imaging in scattering media is challenging. Current methods require a complex and expensive experimental setup or suffer from low resolution. Through the gating of photons exiting the scattering media using a restricted numerical aperture (NA) fiber optic plate (FOP), we establish a novel spatio-angular filter (SAF) imaging device that facilitates significantly (2-3 fold) deeper imaging in scattering media. Under scattering conditions, lower-angle photons are more likely to preserve directional information, which aligns with the acceptance cone of lower-NA fibers. As a result, using a low NA limits crosstalk while collecting the more directionally preserved ballistic and snake photons, which are relevant for contrast enhancement in scattering environments. Experimental and simulation results are presented.