

Automatic force-controlled 3D photoacoustic system for human peripheral vascular imaging: supplement

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Supplement DOI: <https://doi.org/10.6084/m9.figshare.21865365>

Parent Article DOI: <https://doi.org/10.1364/BOE.481163>

Supplementary material description

We measured the axial resolution, lateral resolution, and tomographic resolution of this system through phantom experiments. A phantom of carbon filament (diameter 7 μm) was placed in a tank filled with deionized water (See Fig. S1(A)). The carbon filament was fixed on the surface of the phantom and placed transversely for imaging. Then we turned the phantom 90 degrees to place the carbon filament longitudinally for imaging. Fig. S1(B) and S1(C) are 2D PA tomographic images of carbon filaments placed transversely and longitudinally, respectively. The axial and lateral resolutions were quantified by measuring the full-width half maximum (FWHM) of the normalized 1D amplitude profile along the white dotted line in Fig. S1(B) and S1(C). We applied piecewise cubic Hermite interpolation polynomial (PCHIP) on the normalized 1D amplitude profile. As shown in Fig. S1(D) and S1(E), the axial resolution and lateral resolution of this system are 0.237 mm and 0.257 mm, respectively. To measure the tomographic resolution of the system, we scanned 19 steps with a 0.1mm interval along the direction perpendicular to the transversely placed carbon filament and reconstructed the 3D PA image from the 19 2D PA tomographic images according to the coordinates. Fig. S1(F) presents the top view maximum amplitude projection (MAP) image of the 3D PA imaging. The tomographic resolution was quantified by measuring the FWHM of the normalized 1D amplitude profile along the white dotted line in Fig. S1(F). We also applied PCHIP interpolation on the normalized 1D amplitude profile. As shown in Fig. S1(G), the tomographic resolution of this system is 0.274 mm.

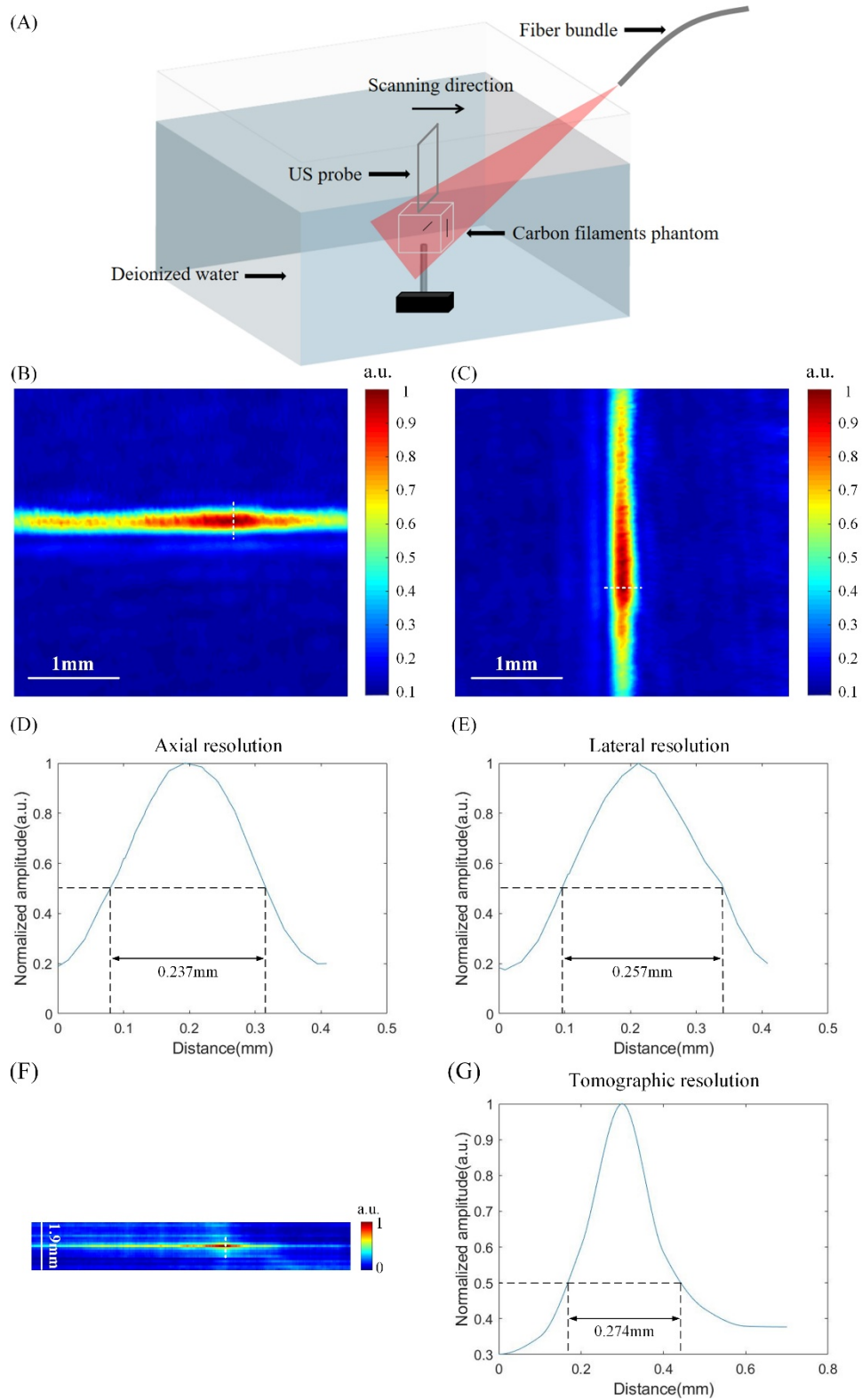


Fig. S1(A) is the schematic of the experimental setup; (B) and (C) are the 2D PA tomographic images of carbon filaments placed transversely in the phantom and longitudinally in the phantom, respectively; (D) and (E) are the FWHM of the normalized 1D amplitude profile along the white dotted line in Fig 1(B) and (C), respectively; (F) is the top-view MAP image of the 3D PA imaging; (G) is the FWHM of the normalized 1D amplitude profile along the white dotted line in Fig. S1(F).