PUSHING OPTOACOUSTIC MICROSCOPY TO THE NEXT LEVEL VIA IMPULSE RESPONSE CORRECTION

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Introduction: Optical-resolution optoacoustic (photoacoustic) microscopy emerges towards a powerful modality for biological and clinical research as it features high spatial resolution, deep imaging, label-free examinations, high sensitivity, and intrinsic 3D readings[1,2]. However, its performance is still restricted by missing implementations of signal correction methods incorporating the underlying physical process from signal generation to digitization[3–5]: from optical absorption upon short laser pulse excitation, conversion to acoustic waves, acoustic detection in 3D, to transducing to electrical signals - collectively known as the microscope's total impulse response (TIR).

Methods/Results: Here, we describe the first complete TIR characterization of an optoacoustic microscope, obtained using a new method of spatially distributing optoacoustic point sources that allowed us to correct *in vivo* and *in vitro* data. TIR-correction yielded >30% axial resolution enhancement as well as one order of magnitude SNR improvement. Finally, the herein presented method constitutes a novel concept to exploit the true potential of optical-resolution optoacoustic microscopy, which could make it more competitive with other well-established microscopy modalities.

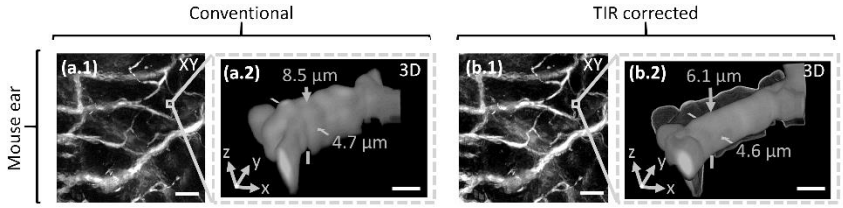

Fig. 1 Imaging of an in vivo mouse ear using (a.1-2) the conventional reconstruction and (b.1-2) the TIR-correction.

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