

The Characterization of the Cylindrical Therapeutic Transducers using Time Reversed Acoustic Holography.

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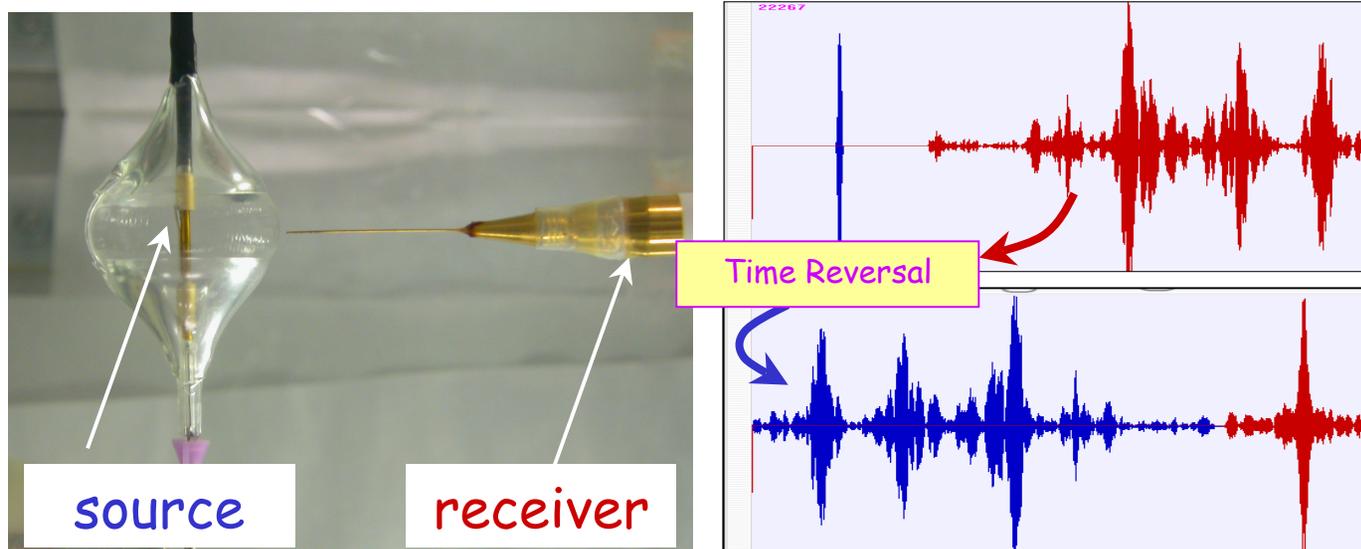
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TRA principle

The time reversed acoustic (TRA) technique is based on the reciprocity of acoustic propagation, which implies that the TRA version of an incident pressure field naturally refocuses on its source.

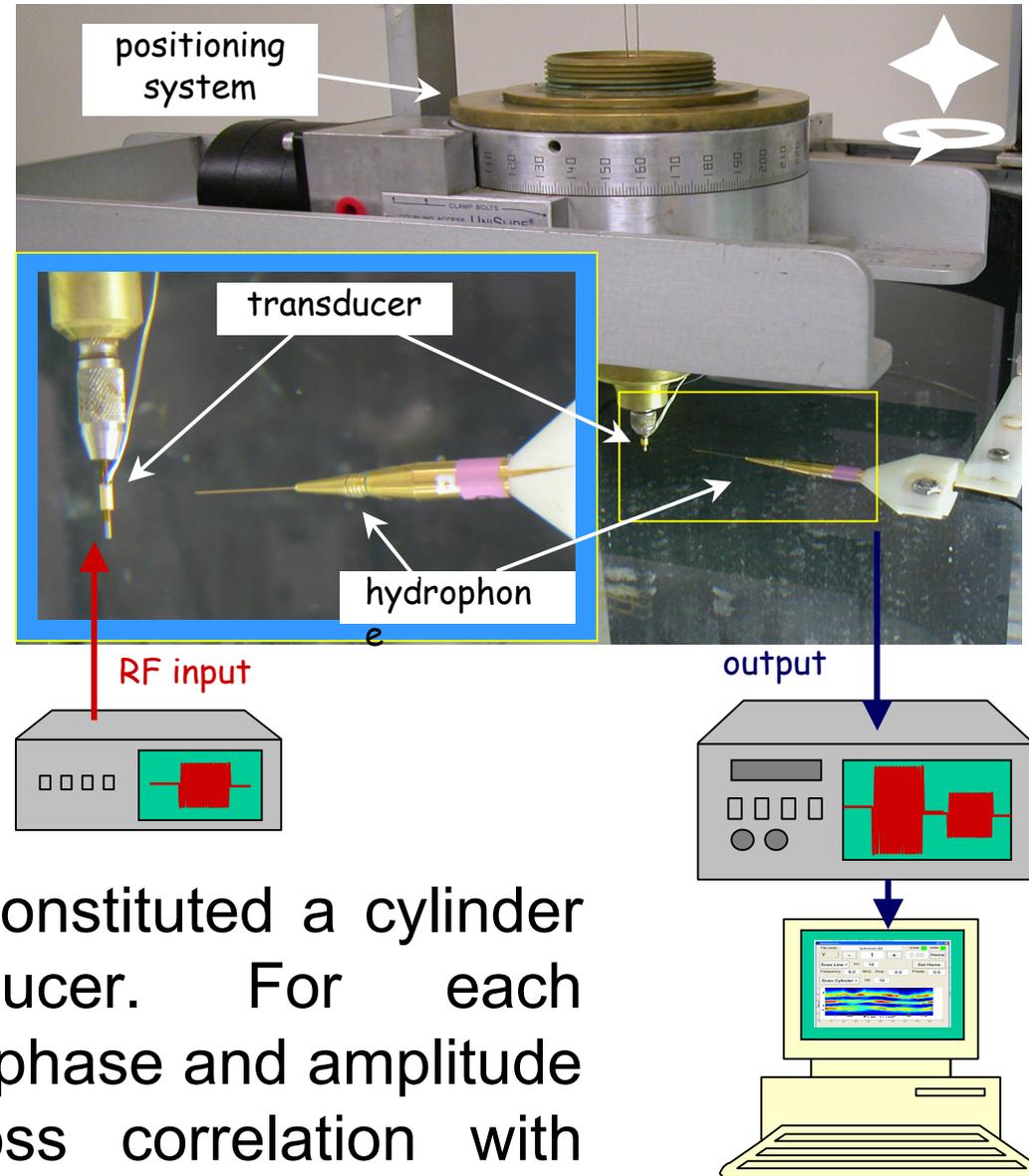


This work describes an application of TRA principle to holography for the special case of cylindrical sources.

Holography setup

Step 1: Short RF burst is applied to the transducer.

Step 2: Impulse response is recorded with hydrophone, displayed on the oscilloscope and transferred to the computer.



The hologram surface constituted a cylinder coaxial with transducer. For each measurement point, the phase and amplitude are derived using cross correlation with reference frequency

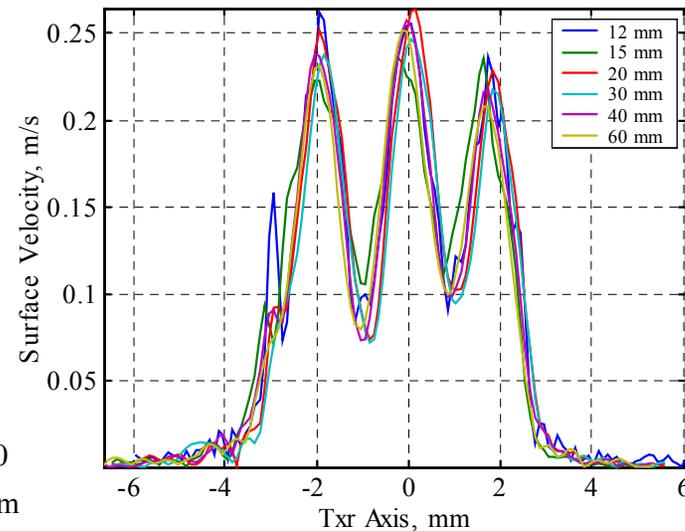
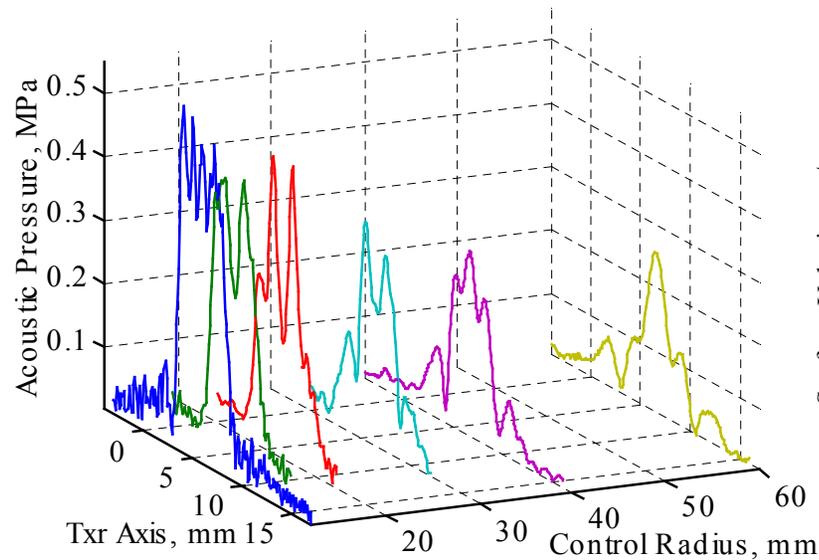
Method verification

Surface velocity profiles reconstructed from different distances to the cylindrical transducer are in good agreement. The distance between the source to hologram surfaces was varied from 10 to 60 mm, which corresponds to the transition between near field and far field.

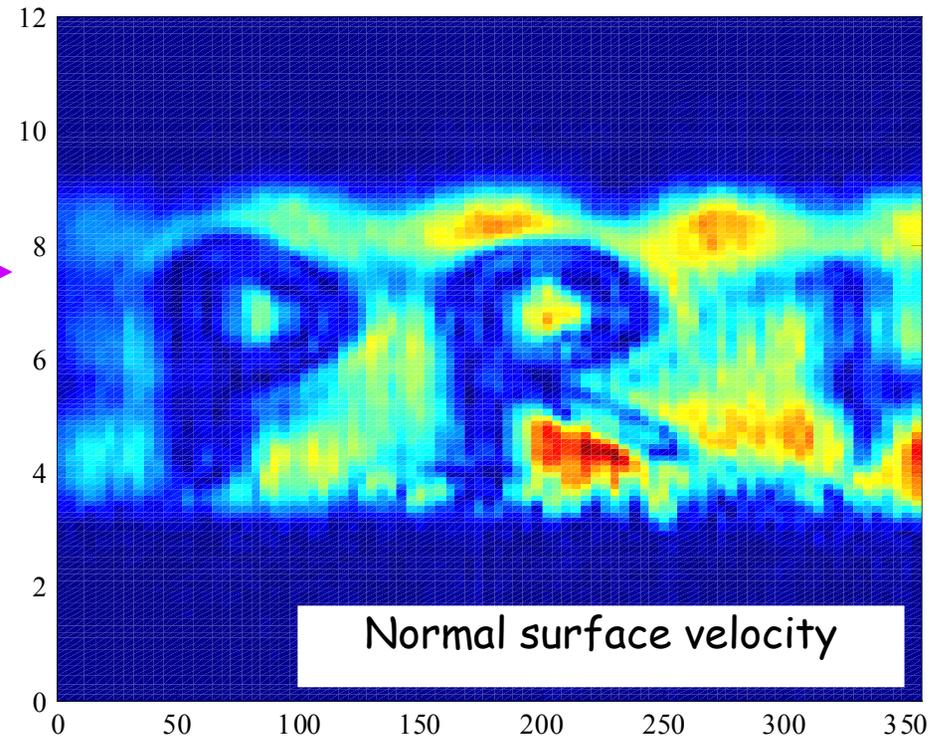
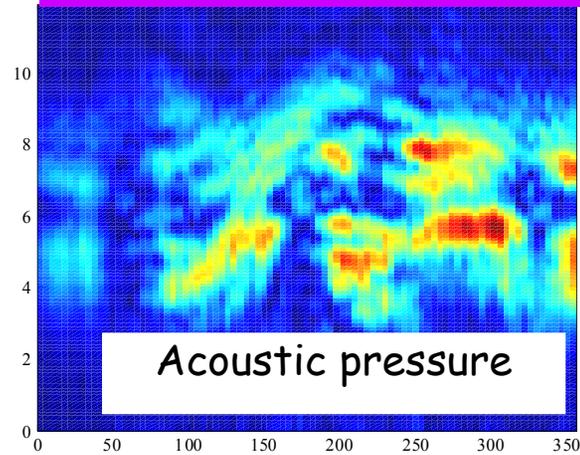
Acoustic pressure at
different distances



Reconstructed
surface velocity



Transducer with wax



Conclusion

The acoustic holography based on TRA principle provides a low cost, instrumentally and computationally simple, fast and reliable method of characterizing surface vibration of the cylindrical piezoelectric transducers.