

Abstract Submitted
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Time Reversal Experiments in Chaotic Cavities¹ BO XIAO, EDWART OTT, THOMAS ANTONSEN, STEVEN ANLAGE, CNAM, University of Maryland — Wave focusing through a strongly scattering medium has been an intriguing topic in the fields of optics, acoustics and electromagnetics. By introducing the time reversal technique, prior knowledge about each transmission channel is no longer needed since the step of sending waves through the medium measures this information. Many approaches have been explored to achieve better focusing quality, which is influenced by several factors, such as the propagation loss. We present two methods to conduct time reversal experiments in ray-chaotic billiards or cavities. The first method uses a ray-tracing algorithm to calculate orbit information from knowledge of the cavity geometry. We then use this information to generate a synthetic signal, which is then sent into the cavity as if it's the time reversed signal in the traditional time-reversal scheme. This method tries to obtain channel information numerically but has limited accuracy due to the chaotic properties of the cavity. Another method is to utilize the transmission scattering parameter, obtained from the time domain response of the cavity between two ports. We amplify the time-reversed signal for each frequency channel in proportion to the loss it experiences during the transmission. The experimental results show that the amplitude of side lobes around the reconstructed signal is reduced significantly and the correlation between the reconstruction and the initial signal is improved from 0.8 to 0.98 in a low-mode density cavity.

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