

Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Nonlinear Time-Reversal in a Wave Chaotic System¹

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— Time reversal mirrors are particularly simple to implement in wave chaotic systems and form the basis for a new class of sensors [1-3]. These sensors work by applying the quantum mechanical concepts of Loschmidt echo and fidelity decay to classical waves. The sensors make explicit use of time-reversal invariance and spatial reciprocity in a wave chaotic system to remotely measure the presence of small perturbations to the system. The underlying ray chaos increases the sensitivity to small perturbations throughout the volume explored by the waves. We extend our time-reversal mirror to include a discrete element with a nonlinear dynamical response. The initially injected pulse interacts with the nonlinear element, generating new frequency components originating at the element. By selectively filtering for and applying the time-reversal mirror to the new frequency components, we focus a pulse only onto the element, without knowledge of its location. Furthermore, we demonstrate transmission of arbitrary patterns of pulses to the element, creating a targeted communication channel to the exclusion of 'eavesdroppers' at other locations in the system. [1] Appl. Phys. Lett. 95, 114103 (2009) [2] J. Appl. Phys. 108, 1 (2010) [3] Acta Physica Polonica A 112, 569 (2007)

¹Work funded by the Intelligence Community Postdoctoral Research Fellowship Program and the Center for Nanophysics and Advanced Materials. Matthew Frazier
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Date submitted: 11 Nov 2011

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