Abstract Submitted
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Nonlinear Time-Reversal in a Wave Chaotic System[1] MATTHEW FRAZIER, STEVEN ANLAGE, BINIYAM TADDESE, EDWARD OTT, THOMAS ANTONSEN, University of Maryland — Time reversal mirrors are particularly simple to implement in wave chaotic systems and form the basis for a new class of sensors [1-3]. The sensors make explicit use of time-reversal invariance and spatial reciprocity in a wave chaotic system to sensitively 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 [4]. 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 brief-in-time excitation only onto the nonlinear element, without knowledge of its location. Furthermore, we demonstrate a model which captures the essential features of our time-reversal mirror, modeling the wave-chaotic system as a network of transmission lines arranged as a star graph, with the discrete nonlinearity modeled as a diode terminating a particular line. [1] Appl. Phys. Lett. 95, 114103 (2009) [2] J. Appl. Phys. 108, 114911 (2010) [3] Acta Physica Polonica A 112, 569 (2007) [4] arXiv:1207.1667

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