

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Application of Iterative Time-Reversal for Electromagnetic Wave Focusing in a Wave Chaotic System¹ BINIYAM TADDESE, THOMAS ANTONSEN, EDWARD OTT, STEVEN ANLAGE, University of Maryland — Time-reversal mirrors exploit the time-reversal invariance of the wave equation to achieve spatial and temporal focusing, and they have been shown to be very effective sensors of perturbations to wave chaotic systems. The sensing technique is based on a classical analogue of the Loschmidt echo [1]. However, dissipation results in an imperfect focusing, hence we created a sensing technique employing exponential amplification to overcome this limitation [1,2]. We now apply the technique of iterative time-reversal, which had been demonstrated in a dissipative acoustic system, to an electromagnetic time-reversal mirror, and experimentally demonstrate improved temporal focusing. We also use a numerical model of a network of transmission lines to demonstrate improved focusing by the iterative technique for various degrees and statistical distributions of loss in the system. The application of the iterative technique to improve the performance and practicality of our sensor is explored.

[1] B. T. Taddese, et al., Appl. Phys. Lett. 95, 114103 (2009).

[2] B. T. Taddese, et al., J. Appl. Phys. 108, (2010) in press; arXiv:1008.2409.

¹This work is supported by an ONR MURI Grant No. N000140710734, AFOSR Grant No. FA95501010106, and the Maryland CNAM.

Biniyam Taddese
University of Maryland

Date submitted: 22 Dec 2010

Electronic form version 1.4