

ACOUSTICS2008/2872 Time Reversal Acoustic focusing with random reverberator

Laurent Fillinger^a, Alexander Sutin^{b,c} and Armen Sarvazyan^c

^aArtann Laboratories/ Stevens Institute of Technology, 711 Hudson St, Hoboken, NJ 07030, USA

^bStevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ 07030, USA

^cArtann Laboratories, 1753 Linvale-Harbourton, Lambertville, NJ 08350, USA

Time Reversal Acoustic (TRA) focusing system based on an external reverberator can provide good focusing with minimum side lobes even with a few transducers. The focusing ability of such system can be increased using reverberator with rough boundaries or by adding internal random scatterers. The experiments were conducted with a reverberator made of a polyethylene bottle filled with water and a single piezoceramic disk attached externally to its wall. Experiments demonstrated that inserting in the bottle random hard scatterers or altering of the bottle surface significantly decreases the size of the focused spot and the level of side lobes. The new pseudo-impulse method of TRA focusing allowed suppressing piezotransducer resonances and provided formation of short wide band signals. The ability of such TRA focusing system based on random reverberator to form simultaneously multiple focuses and produce focal spots of the complex shape has been demonstrated. The application of binary radiation regime led to several fold increasing of the amplitude of the focal spot while the focal structure practically was not affected. Applications of such random focusing system for medical imaging and HIFU treatment is discussed.