

Investigation of Cross-Coupling in Piezoelectric Transducer Arrays and Correction

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Abstract

Cross-coupling in piezoelectric transducer arrays is an undesirable phenomenon which decreases the performance of these devices. Indeed, when one element of a transducer is driven, it generates parasitic displacement fields at the radiating surfaces of the neighboring elements, which changes the directivity of the array. The objective of this paper is to investigate the cross-coupling effects on the piezoelectric transducer arrays performance and to propose solutions to reduce this parasitic phenomenon. In this context, it is demonstrated that a filling material having high mechanical losses contributes to the reduction of cross-coupling. In addition to this, a procedure of active cancellation of cross-coupling is successfully tested in the case of two transducer arrays vibrating in the transverse mode for the first prototype and thickness mode for the second one. Finally, the ability of the method is demonstrated even when the displacement at the radiating surface of the transducer array is not uniform.

Keywords: cross-coupling, piezoelectric transducer arrays, correction method

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