

ACOUSTICS2008/14 Dynamic response of an insonified sonar window

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This talk derives and evaluates an analytical model of an insonified sonar window in contact with an array of Tonpilz transducers operating in receive mode. The window is fully elastic so that all wave components are present in the analysis. The output of the model is a transfer function of a transducer element output voltage divided by input pressure versus arrival angle and frequency. This model is intended for analysis of sonar systems that are to be built or modified for broadband processing. The model is validated at low frequency with a comparison to a previously derived thin plate model. Once this is done, an example problem is studied so that the effects of higher order wave interaction with acoustic reception can be understood. It was found that these higher order waves cause multiple nulls in the region where the array detects acoustic energy and that their locations in the arrival angle-frequency plane can be determined. The effects of these nulls in the beam patterns of the array are demonstrated.