Journal Of Canadian Acoustical Association

Volume 46, Issue 3, 2018, Pages 19-28

# SIMULATION STUDY OF SUPER-RESOLUTION IN HYDROPHONE MEASUREMENTS OF PULSED ULTRASONIC FIELDS

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**Abstract:** In order to carry out reliable measurements of pulsed ultrasonic fields, the use of a piezoelectric hydrophone as receiver is recommended. However, due the finite size of the receiver aperture the measured acoustic pressure is affected by spatial averaging on the surface active face. The aim of this work is to deconvolve the spatial effects of the receiver hydrophone in order to reconstruct the pulsed ultrasonic field with a better spatial resolution. Hereby, the linear pulsed pressure field radiated in water by wideband planar transducers of 19 mm diameter, with central frequencies fc=2.25 MHz and fc=15 MHz are considered. The receivers are PVDF membrane hydrophones of 25 µm - thickness with rectangular and circular apertures. The results of this study show the strong dependency of the reconstruction quality upon the signal-to-noise ratio (SNR). Generally, the quality of the reconstruction decreases with decreasing SNR. Good reconstruction quality has been obtained with correlation coefficient larger than 0.9936 when the “acquired” signals are not too much noisy (SNR=60dB). In this case, improvement of the spatial resolution by a factor of 5 and 9 respectively could be reached. The reconstruction quality depends also upon the hydrophone dimensions, the axial distance to the source, the central frequency and the spectral frequency bandwidth of the pressure pulse.

**Keywords :** Super-resolution, spatial inverse filter, spatial Wiener filter, PVDF hydrophone, pulsed ultrasonic field, ultrasonic field reconstruction.