

Fine-Spatial-Scale Measurement of the Mid-Frequency (1 kHz-10 kHz) Ocean Noise Field with a Vertical Billboard Array

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Abstract: A 131-element hydrophone array for measuring the ocean's mid-frequency (1-10 kHz) noise field was designed, built, and deployed by the Marine Physical Laboratory in 2002. The major portion of the array is composed of 4 vertical staves of 32 elements each with equal horizontal and vertical interelement spacing of 0.2 m (half wavelength at 3.75 kHz), forming a 2D billboard configuration. Three additional hydrophones are installed to provide larger horizontal aperture. Another three channels are terminated with non-acoustic, electrically-equivalent plugs to provide data on the electronic self noise of the array subsystems. Each of the 134 channels is digitized at a 12 Ksamples/sec rate. The array was deployed from R/P FLIP in 175-m-deep water and data were recorded nearly continuously

over a week-long period. Upon deployment, three tiltmeters were attached to the array support frame to measure heading, pitch, and roll of the array, as well as water temperature and depth. The dynamics of the array over time from the tiltmeter data, the array self noise characteristics, and its vertical beam pattern as determined by in-situ calibration measurements are the focus of this paper. Examples of the azimuthal dependence of the vertical spatial structure of the mid-frequency noise field, determined both by conventional beamforming and an approach that combines conventional in the vertical and adaptive in the horizontal, also are presented to illustrate the high quality nature of the array measurements. [Work supported by the Office of Naval Research, Code 321(US)].