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THE LOCAL STRUCTURE OF INTERFERENCE FIELD IN THE SHALLOW SEA

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ABSTRACT

The statistic analysis of phase and vector energy parameters of interference acoustic field in the shallow sea is presented in the study. Mathematical analysis of the vector acoustic field was based on the inverse Fourier and Hilbert transforms including also the general vector equations of the vector field. The signal was considered as a complex and harmonic wave while the field as a stationary and ergodic one. The experimental method was based on vector-phase measurements. The experiment was accomplished in the Sea of Japan in 2013. The combined 16-channeled receiver system was installed at 15-meter depth while the total depth of the spot was 30 m. Frequency range was about – 108±2 Hz. The experiment resulted in the following temporal functions: phase-difference parameters of four field components, x-, y-, z-components of coherence function, the norm components of intensity vector rotor and acoustic pressure envelopes. Statistic processing of the experimental data was based on the analysis of probability density distribution of phase difference of the vector field components and the norm orthogonal components of rotor of intensity vector. The statistic analysis of experimental data revealed the following: power motion in horizontal and vertical waveguide planes in the shallow sea significantly differed; horizontal component of intensity vector carried long-period and local fluctuations leading to power direction fluctuation to the opposite one. In the vertical plane the power motion occurred according to almost determined periodical process in "surface-to-bottom" direction whereas the density of local vortex structures at 50 and 150 seconds durations was no less than 0.8 and the interferential field was statistically homogeneous. The obtained results were authentic and could be used to create a real acoustic model of a shallow sea.

Keywords: acoustics of shallow sea, acoustic complex intensity, vector acoustics, vector-phase method, vector intensity vortex, combined acoustic receiver.

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