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**OPTIMIZATION OF THE DIRECTIONAL CHARACTERISTICS OF HIGH-FREQUENCY SIDE SCAN SONAR**

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**ABSTRACT**

In designing of high-frequency side-scan sonars (SSS) the properties of the directional pattern in the vertical plane are of a great importance in addition to the main characteristics, such as operating range and angle/distance resolution. Primary beam and one or two side lobes are usually used to form directional pattern in SSS survey. Deep minimums (“zeros”) in a directional beam pattern separating main beam and side lobes lead to very weak echo-signals in small areas at near viewing zone of SSS. They are visually displayed on the echogram as dark vertical stripes that extend along the sea-bottom line. The main beam of the vertical directional pattern may be expanded by a simple reduction of the transverse aperture array. It eliminates such “zeros”, but leads to unacceptable reduction of sonar operating range. Creating a sonar transducer (antenna) with a specific form of the directional pattern in the vertical plane is a difficult task. One of the specific forms of antenna known in the field of radar technology is so-called “cosecant” antenna. Unlike radar developments, in the sonar technologies the specific hydrologic laws must be taken into account. They include backscattering of sound and especially attenuation of sound in water depending on the frequency and the distance to the target. Numerical modeling allows facilitating the task of developing the antennas with the required characteristics. The model of SSS transducer with the directional pattern, similar to cosecant form was performed in the “MATLAB” environment. The working prototype of SSS antenna was manufactured in the form of an experimental shortened transducer on the basis of this numerical model. The positive results achieved in the tests of working prototype may form the basis for creation of effective.

Key words: side-scan sonar, directivity pattern, sound attenuation, backscattering, numerical modeling.

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