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**Standard-target method of calibrating active sonars: principles,
applications, benefits**

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The standard-target method of calibrating active sonar involves suspending a target at a known position in a sonar beam, insonifying it with a known signal, measuring the scattered pressure field, and relating this to the scattering properties of the target. These properties are known a priori for standard targets, rendering the calibration primary. Repetition of the procedure for different relative sonar-target positions can enable determination of directional and nearfield characteristics. Following a review of standard-target calibration principles, the method is illustrated for both narrowband and broadband scientific echo sounders and multibeam sonars, with operating frequencies in the range 18-3200 kHz. Applications to sidescan sonar and to low-frequency parametric sonars and other mid-frequency sonars in the nominal range 1-10 kHz have not yet been developed, but are evidently feasible given preliminary standard-target designs, which are described. In every case, the standard targets are of a proven manageable size, with immersion weight less than 200 N. Benefits of standard-target calibration, including accuracy, operational convenience, and cost-effectiveness, among others, are emphasized. The method, which is useful for both quantitative and qualitative imaging applications, extends to borehole acoustic sensors and medical ultrasonic devices.