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An optimized observational network design for USBL calibration via geodetic network robustness analysis as an offshore standard method Case study: calibration of Simrad HPR USBL

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Calibration is the most important task for any underwater positioning system - such as USBL - prior to the operation of any hydro-acoustics. In preparation for the setup of an observational network, accuracy of data must be considered and this is done by taking into account the accuracy of the variable factors that determine the precision of data. Due to vessel's dynamic movements and rotations, the only way to get an accurate result is to acquire data relating to the USBL slant range and variable movement such as heading, pitch and roll, horizontal and vertical motions together. It is also critical that the operator establishes the velocity of the sound, as this important parameter determining the speed of the acoustic signal through the water column. This must be taken into account while operating any underwater positioning equipment. Prior to any USBL calibration activity, the noise and errors must also be established and corrections applied according. Finally then, the observation network will be accurately setup to acquire the data and operations can commence with a high degree of precision. Specifically, Kongsberg HPR and Sonardyne hydro-acoustic positioning both have their own particular methodology for designing a geodetic network and establishing calibration parameters. The lack of a standardized offshore procedure for USBL calibration exists between these two. The focus of this research is to compare the geodetic network setups for both Kongsberg HPR and Sonardyne and in doing so

establish a new geodetic network. This new geodetic network design will be presented as a theorem with a solution based on moving toward the most robust geodetic network possible. The purpose of this article is to present the robustness of these methods in order to establish a better geodetic network. In conclusion, the optimized geodetic network is introduced as an offshore survey standard.