# Imaging laser scanner for hydrographic vessel offset surveys: a few case studies

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Multibeam surveying requires accurate knowledge of a vessel reference frame to translate soundings from the sonar to a geographical reference frame. Traditionally Total Stations (TS) are used to establish vessel reference systems. TS surveys provide the necessary accuracy for the location of sensors and have the required range to cover the ship and surrounding areas. These field procedures require an experienced operator and can span days, causing a higher likelihood of user error. The angular misalignments of the sensors are computed using short baselines usually constructed from two points, limiting the confidence in the results.

On the other hand, laser scanners can scan the same area into a high-density point cloud within minutes. Built-in georeferencing algorithms make it simple to connect scans to generate a 3D model of the area. However, laser scanners with comparable accuracies to a TS are more expensive than TSs. Also, laser scanners produce exponentially more data requiring higher computing power for processing.

This study was set up to evaluate if a low-cost imaging laser scanner, Leica BLK-360, in tandem with a TS, Sokkia NET05 AXII, can increase confidence in the angular misalignment measurements. A TS was used to set up the vessel reference frame, while the BLK was used to scan the IMU and sonars in the established reference frame, providing many points for calculations. In one case study presented in this paper, IMU angular misalignments on the NOAA Ship *Okeanos Explorer* were computed. A second case study computed the angular misalignment of a pole-mounted IMU and multibeam system on the *R/V Virginia*. The 3D point cloud representing the surfaces of the IMU and sonar were extracted as planes for the angular misalignment calculations. These results are compared with the TS computations. Analysis of achievable accuracies from the low-cost BLK-360 is also presented.