

**Title:** Tightly Integrated Second Generation Acoustic-Inertial Position Reference Systems Deepwater Operations Results

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**Abstract**

It is increasingly well known that acoustic inertial position references make DP systems more robust by improving the precision, update rate and availability of position data whilst simultaneously offering operational cost savings. This paper presents a second generation of tightly integrated acoustic-inertial position reference systems that are scalable to realize these benefits across a range of vessel types and operations from light intervention to deepwater drilling.

The tightly integrated acoustic-inertial systems utilize the individual acoustic transceiver measurements at the phase (bearing) and travel time (range) level and make use of a very rich set of high-integrity quality metrics provided by wideband signal processing. This results in much enhanced weighting between the acoustic and the inertial measurements and it also means that that acoustic aiding of the INS will carry on even when the acoustic system by itself cannot form a reliable position.

Deepwater operational results will be presented that show accuracy approaching that of modern GNSS and a previously unseen level of robustness when operated with a full LUSBL array of transponders. Due to the optimal tight-integration of the 2nd generation system, extremely accurate and robust operation is also possible with fewer transponders offering operational efficiency as well as enhanced reliability.

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