



# Performance Test Lessons Learned: Interferometry Down-sampling and Filtering

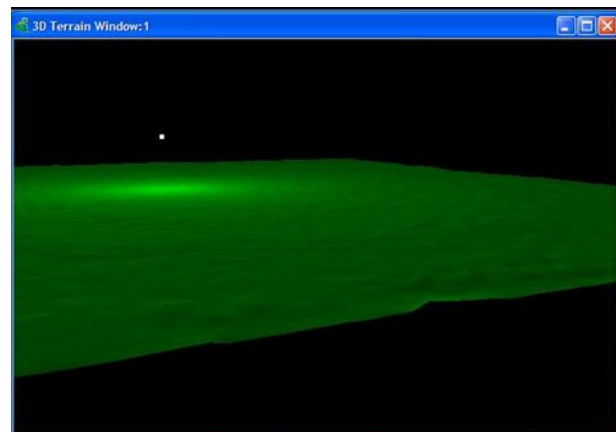
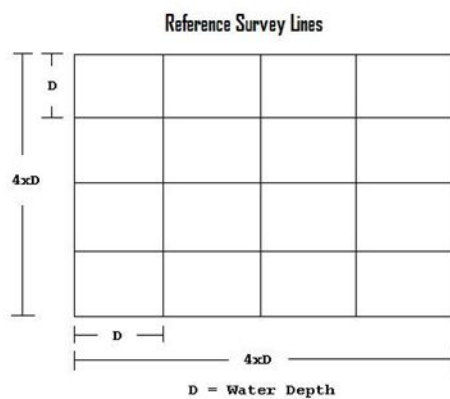
By Christian Shaw

While on a recent visit to beta test HYPACK® 2012. I had the opportunity to try my hand at Multibeam Performance testing on an Interferometric system (IFMS).

## *PERFORMANCE TEST REQUIREMENTS:*

- **A very flat survey area.** Testing in a flat area ensures that all GPS errors are removed from influencing the overlapping sweeps where we want to calculate the system repeatability and find the overall accuracy of the sonar system.
- **Two sets of five parallel lines,** with a separation of planned lines equal to the water depth. The line sets run perpendicular to each other and each cover the entire test area.
- **A matrix file** with a 1 x 1 cell resolution prepared in the MATRIX EDITOR.

*FIGURE 1. Creating Planned Survey Lines and Matrix for the Reference Surface*



## *DATA COLLECTION*

In HYSWEEP® SURVEY, we collected data over each line.

One thing we overlooked was the basic filtering of the Interferometry data. Because HYSWEEP® has a limit of 1440 beams per ping of MB data. IFMS systems generate much more than our limit and most of it is unusable noise. In addition to down-sampling, we should have filtered the data as well. IFMS systems are not like traditional multibeam systems that use beam-forming; IFMS systems use evenly spaced transducers to measure the phase differences of the pings. The phase angle is then used to calculate the take off angle when the sounding is returned to the transducer. The angle along with the range on the 2 travel times down and back are used to calculate the position of the ping.

Sounds good to me..lets roll... Right?

**Wrong.** IFMS systems have TONS of noise and, if you collect it all, you can be very disappointed when you get back to the office. What we did not understand is with all of the soundings coming in and being all over the place, we needed to pick and weave through to

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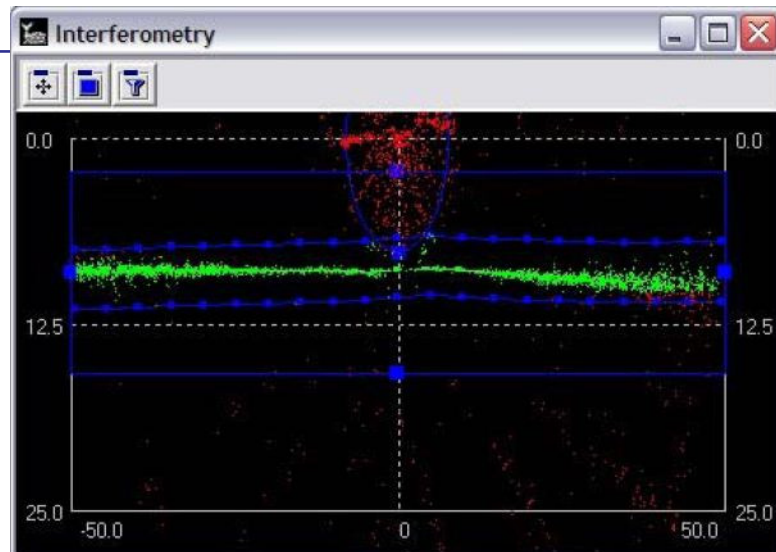
keep the best “Fit” soundings possible. There are good soundings in this data set, however its how we pick them out that matters.

HYSWEEP® has the Interferometry window where filtering is introduced and where you should start first if you have a IFMS system.

**FIGURE 2.** HYSWEEP®  
*Interferometry Window*

HYSWEEP® will use processing options to filter this for you. At minimum, the Along-Track filter or the Across-Track filter need to be used. The Along-Track filter uses a number of bins at a user-specified height to flag data as good. All data outside this height, across the bin are rejected from being written to the HSX.

The Across-Track filter is used typically with the Along-Track filter with a smaller height. Visually you will need to see gate filters in the data window. With this set of blue lines shown, it is the data that is down-sampled and filtered that will be saved by HYSWEEP® SURVEY.



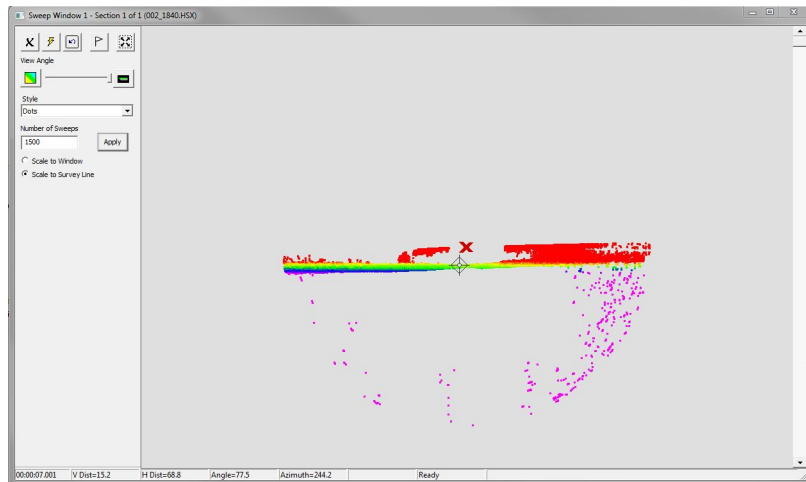
On our survey, we left all the filters unchecked and, although the bottom track in HYSWEEP® looked to be tracking the bottom well, what we found in MBMax (the HYSWEEP® EDITOR) was quite different.

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## ***THE MORAL OF THE STORY***

*Use Interferometric filtering and down sampling at all cost with IFMS MB systems! These systems are like sitting in your comfy \$950 super bowl seats trying to “tune” out all of the Patriot fans yelling at you and only tuning into the Giants fans. Because these systems rely on noisy phase differences to calculate depth, we need to only listen to the good noise with well-established filters, and quality control the HYSWEEP® Interferometric window while running your planned lines.*

**FIGURE 3.** HYSWEEP® Sweep Window



I can't wait to get back on the boat and retry my hand on an IFMS. Ill keep you posted.