

# APPLICATION NOTE

## BROADBAND ACOUSTIC TRACKING OF AN UNDERWATER VEHICLE

### CUSTOMER APPLICATION

- Acoustic Tracking of a Manned Submersible

### SOLUTION

- BATS – Broadband Acoustic Tracking System

### EQUIPMENT

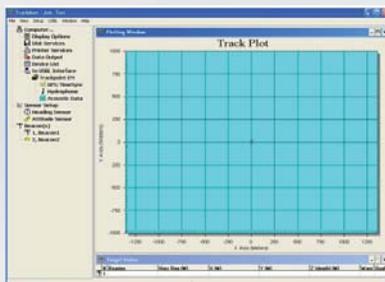
- Underwater Equipment:
  - 4377A Acoustic Beacon
  - Transducer: Omni, 26-30kHz, 1000m depth
  - Pressure Gauge, 1000 meters depth rating
- Shipboard Equipment:
  - BATS Desktop Processor
  - 100 foot cable (from BATS processor to hydrophone)
  - BATS Hydrophone 17-30kHz
  - IPS Navigation Software



### Scenario

Harbor Branch Oceanographic Institute, a research institute of Florida Atlantic University, operates multiple manned submersibles for a variety of interesting missions in the waters throughout the world. The *Johnson-Sea-Link (JSL)* submersibles, about the size of a small helicopter, can dive to a depth of 1000 meters and carry four people. The vehicles have been operating safely and successfully for nearly 40 years taking scientists and observers on unique missions around the globe. The JSL subs have performed work ranging from coral reef and gas hydrate studies to underwater wreck surveys.

The JSL subs are supported by a 204 foot surface vessel, the *RV SEWARD JOHNSON*. In a typical operation the surface vessel shadows the sub during its subsea mission and must keep track of the sub's underwater location at all times. Tracking an underwater vehicle such as a large remotely operated vehicle (ROV) or a small manned submersible such as the JSL can be challenging. There is often acoustic interference from the surface vessel and noise from the environment, other instruments and the subsea vehicle itself. One prominent noise is that which is created by the thrusters on the vehicle. Many standard acoustic tracking systems such as short-base-line (SBL) and ultra-short-base-line (USBL) systems do not perform reliably in these challenging conditions. After trying different systems, the ORE Offshore Broadband Acoustic Tracking System (BATS) was selected for this mission critical application on the Harbor Branch JSL.



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sales@ORE.com | USA 1.508.291.0960

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### Solution

Harbor Branch chose the Broadband Acoustic Tracking System (BATS) made by ORE Offshore (an affiliate of EdgeTech) to assist in the challenging task of tracking their manned submersible, the *Johnson-Sea-Link*. Previously the JSL sub utilized an acoustic tracking system that required the thrusters to be turned off intermittently so the tracking system's acoustic signals could get through to the support vessel. This operation was obviously not ideal for the operation of the vehicle. The use of the ORE Broadband Acoustic Technology provides exceptional range and tracking performance and, because of its unique signal processing techniques, is much better in high noise environments than traditional acoustic tracking systems. While traditional systems use a simple "ping" in the water for reception, the BATS system uses a unique signaling methodology in which the "signal" is spread across a wider band for improved detection and higher noise rejection.



The BATS solution consists of a subsea transponder, shipboard processing unit, interconnect cable and hydrophone. In a typical operating method an electrical signal is sent from the processing unit through the interconnect cable to the hydrophone. The electrical signal is converted to mechanical energy, and enters into the water as an acoustic sound wave. The acoustic signal travels through the water to the transponder that is mounted on the vehicle. The transponder receives the signal and processes it to ensure it was destined for its unique ID code. At that point the transponder replies with a response that includes its pressure sensor information (depth) and unique ID code. The surface unit can then interpret the signal and display the depth, distance and bearing to the subsea unit on its display software, Trackman. In this case the shipboard processing unit on the JSL was configured as a desktop version. Also available are 19-inch rack mount configuration and portable deck box setups. Although not provided in this scenario, the ORE Offshore Motion Reference Unit (MRU) can be added as an option to this system to provide dynamic pitch and roll compensation data for the shipboard unit which assists in more accurate calculations. Every system comes with Trackman, ORE's Windows® based interface software. This user friendly software communicates with the BATS transceiver to allow modification of the target and system parameters and also outputs processed data to Navigation packages. (In this case the Nav Package is ORE's IPS.) The ability to run their vehicle and the acoustic tracking system all at the same time provided enhanced mission operations for Harbor Branch and the JSL vehicle team. The BATS system is useful on manned submersibles and work-class ROV's or other vehicles that operate in deep water conditions where thruster noise or other acoustic interference may be prevalent.

*Thank you to FAU's Harbor Branch for their valuable input to this application note.*

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