DriX used to support deep sea offshore subsea positioning operations in the Mediterranean Sea.

DriX performed subsea positioning integrating iXblue's Gaps Ultra Short BaseLine (USBL) system operated with a Canopus LBL transponder.

CHALLENGE
USV deepwater subsea positioning

SOLUTION
DriX USV equipped with iXblue Gaps USBL acoustic positioning system and operating with Canopus LBL transponder

RESULTS
Precise real time and as laid positioning

In July 2021, DriX was used to perform the subsea positioning of structures during their deployment, and up to their as laid position, on the seabed of the Mediterranean Sea, 60 km away from shore and in 2500m water depths.

▲ DriX working in OTH mode

1. Introduction

For this operation, DriX was used as a positioning vessel during the deployment phase of subsea structures on the seafloor. The main challenges surrounding the operation were:

- The supply vessel deploying the structures had a high acoustic noise that prevented acoustic positioning below 1200m water depths.
- The concept of operation required to live stream the subsea positioning operation to the vessel bridge in order to land the structures at the planned location.
- The accuracy of the final positioning result had to be greater than 50cm.

Leveraging a great track record of successful acoustic positioning operations, DriX was selected by the client for this challenging operation, that also required to transit to site at high speed and to stay at sea in rough weather for several days, all of which DriX excels at.

During operation execution, the DriX operational team was located on-board the supply vessel, allowing for highly effective coordination with the supply vessel crew.

The acoustic positioning system included a Canopus transponder and a Gaps USBL transceiver.

Canopus

Canopus is an intelligent LBL transponder that provides highly performant subsea positioning and monitoring capabilities down to 6,000m. Along with the Ramses transceivers, Inertial Navigation Systems and Delph Subsea Positioning Software, it offers advanced sparse LBL capabilities that allow operators to reduce the number of transponders deployed on the seabed with no compromise on performance.

Gaps

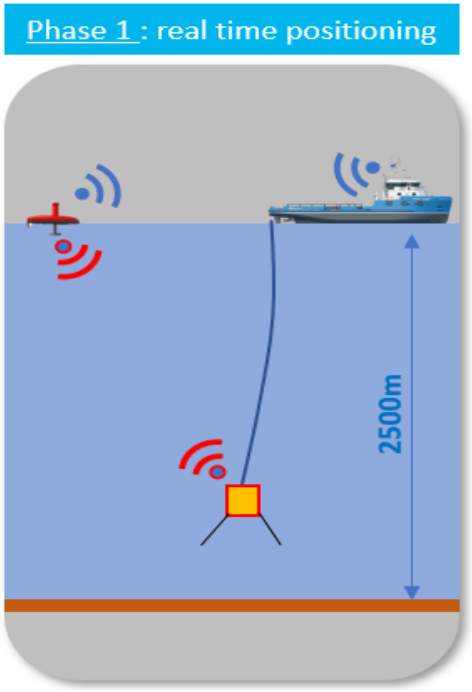
Gaps is a high-accuracy USBL system that offers unmatched horizontal tracking and communication capabilities from 4,000m water depths to extremely shallow water, even at angles above horizontal. Its compact size and high-grade embedded INS streamlined its integration on the DriX USV.

2. Concept of operation

The DriX left the port of la Seyne sur Mer for a 80km transit to join the supply vessel that was already on site. DriX mission was to monitor the deployment of the structures and provide real-time positioning information to the Dynamic Positioning (DP) operator on the supply vessel for them to properly locate the vessel.

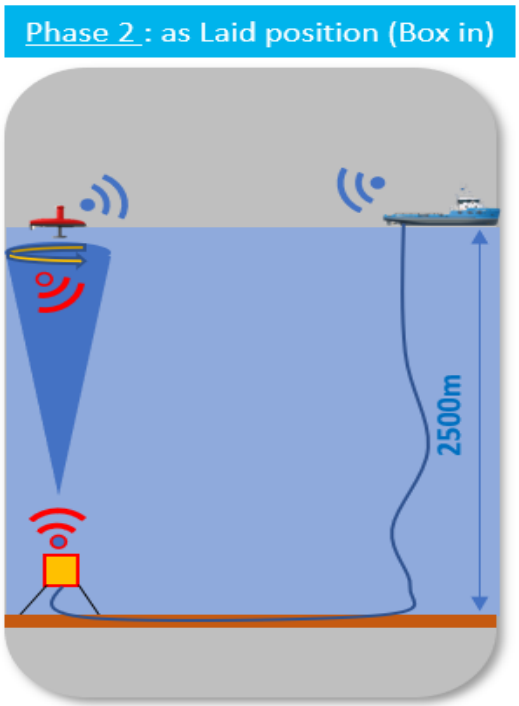
Phase 1

- Structures are lowered down in the water column
- Sound Velocity and transponder depth pressure sensors are being recorded during the descent.
- Gaps USBL tracking starts
- The surveyor on board the vessel connects to Gaps through DriX wireless link to acquire real time USBL positioning data.
- The real time positioning information are displayed for the Dynamic Positioning (DP) operator in order to assist the positioning of the vessel during the structure descent.
- The structure is laid on the seabed.
- USBL fix are performed to confirm the position with an acceptance range.
- The roll and pitch telemetry data from the Canopus transponder are recovered to assess that the inclination of the structures is well within the requirements.



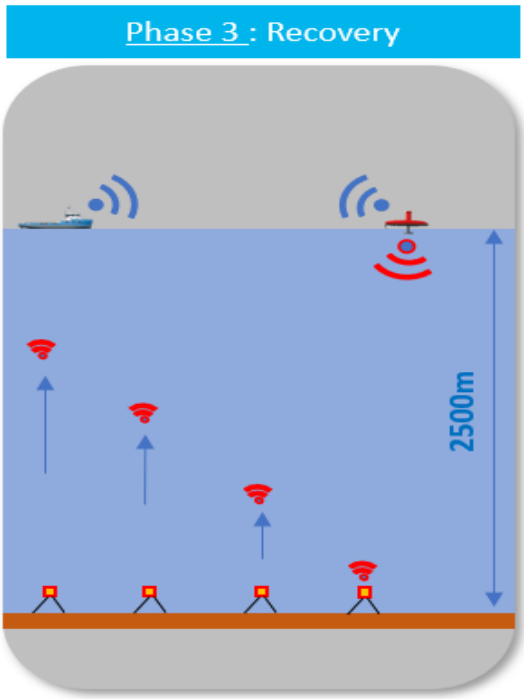
Phase 2

- The final position of the structure is confirmed.
- The inclination (roll/pitch) received is confirmed to be within requirements.
- The supply vessel continues laying the cables
- The DriX remains on station above the transponder.
- Gaps tracking ensures that the structure is not moving.
- A Box-in is performed to determine precise as laid position.
- A processing is conducted to ensure final position accuracy is within client requirements.
- After completion of the positioning operation DriX transits back to the support vessel to start positioning the next structure.



Phase 3

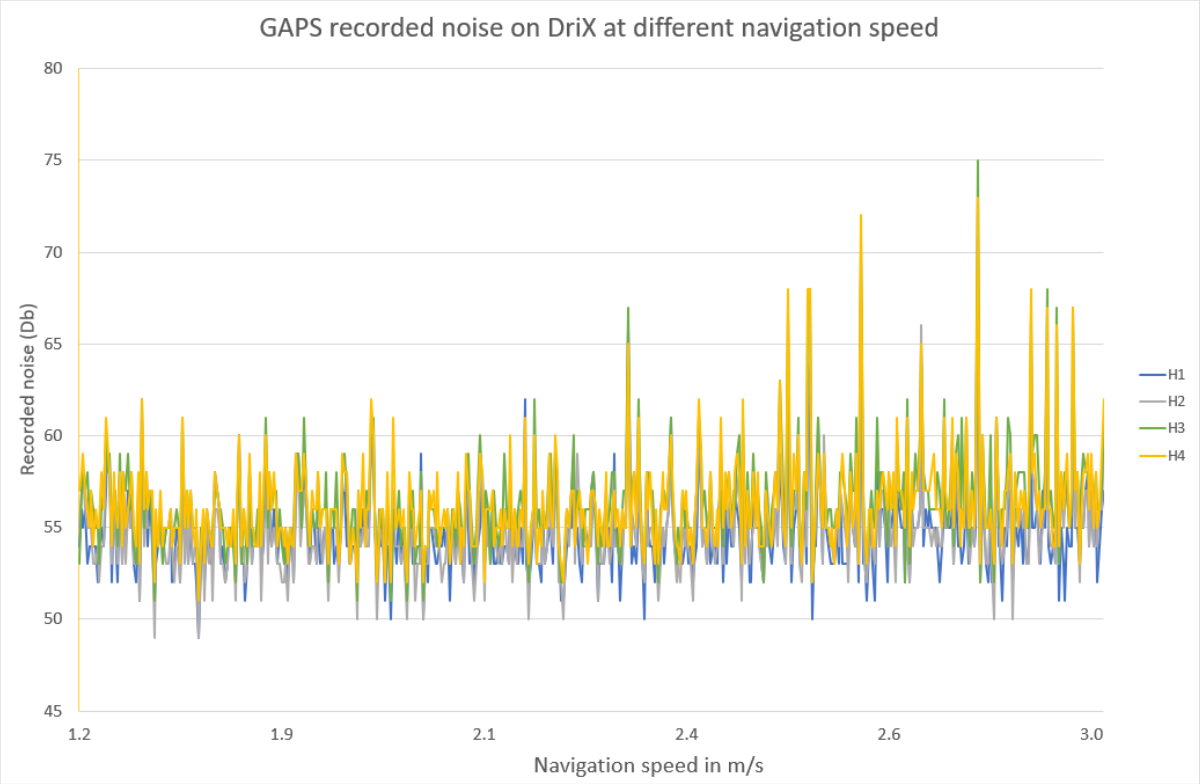
- All beacon positions are confirmed to be within the requirements.
- A Telemetry command is sent through Gaps to release the transponder from the structure.
- Transponders are released and come up to the surface.
- Transponders positions is tracked by DriX on their way up.
- The supply vessel positions itself to recover the transponders



3. Results

DriX's low noise environment

Erreur ! Source du renvoi introuvable. displays the noise level recorded by the Gaps four hydrophones (H1 to H4) during USBL tracking at different speeds.



▲ Fig. 1: GAPS Hydrophone / Noise level in function of navigation speed.

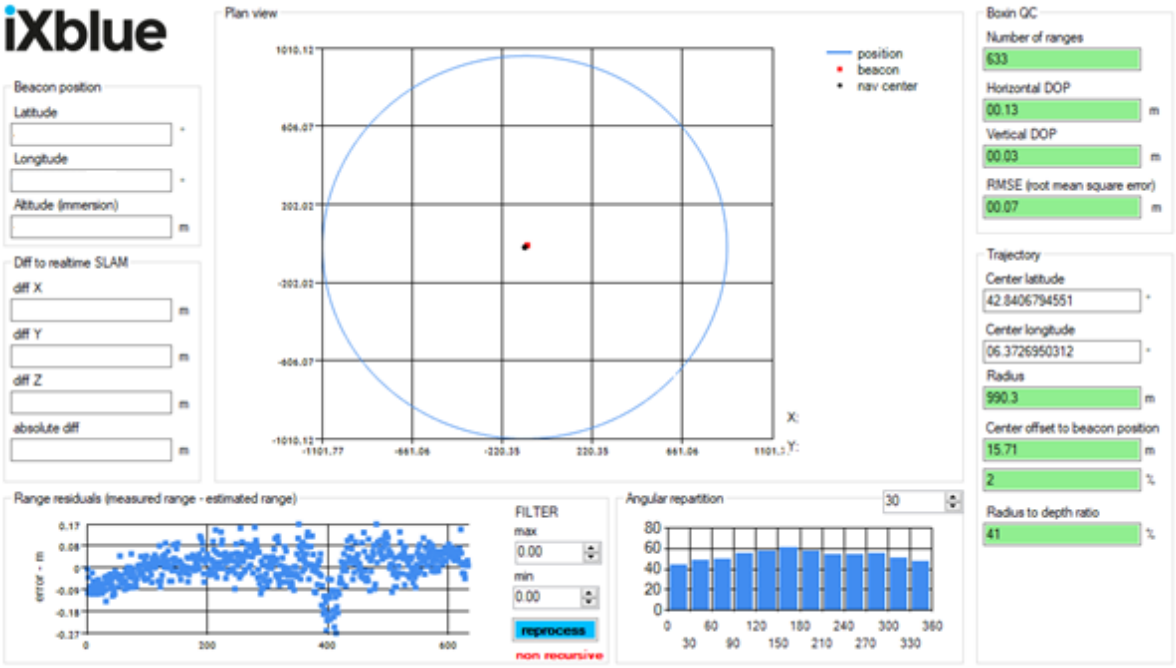
It highlights some important characteristics of the DriX:

- The average noise level is very low (55 dB ref µPa / sqrt(Hz)). For Gaps, this theoretically enables USBL tracking and acoustic communication up to 5500m of slant range.
- The noise level is stable from 0 to 6 knots and the USBL performance (maximum range tracking or positioning accuracy) are not impacted by the speed of the DriX.

This low noise across a wide range of operating speed allows the DriX USV to perform high speed box In, therefore drastically reducing the execution time of those operations.

Box-in result

Erreur ! Source du renvoi introuvable. displays the box-in results. It shows excellent range residuals in almost 2500m of water depths (RMSE of 0.07 m). The accuracy of the box-in is 0.13 m.



▲ Fig. 2: BoxIn results / Snapshot

Conclusion

These results confirm DriX as the best suited asset for deep sea accurate positioning. Its reliability, versatility and low noise environment makes it the perfect tool, saving valuable operation times at sea.