
Recovery of a Bluefin AUV Courtesy of Bluefin

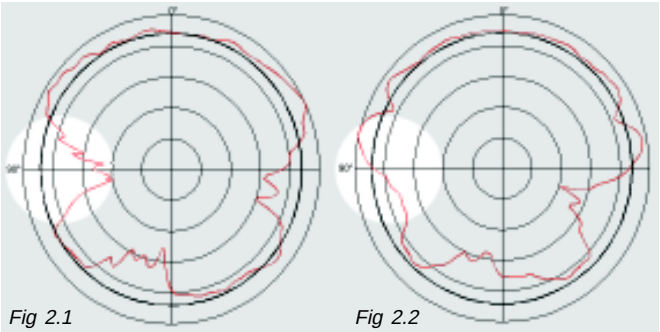
Fig 2.1 Fig 2.2

Fig 2.1 shows the polar plot for an omni-directional transducer flush mounted with the prototype AUV hull. The highlighted area shows how the transducer's sensitivity to signals from the 90º axis (in parallel with the hull) are adversely affected. In contrast, Fig 2.2 shows the polar plot for the same transducer mounted 62mm proud of the hull. This results in a 20dB (>10 fold) improvement in sensitivity along the horizontal.

Positioning for success

Choosing the optimum position for an acoustic transducer on an AUV or ROV requires specialist assessment of the vehicle and its operating environment. Presented here are some of the key factors that need to be considered.

Noise

Noise from a vehicle's propulsion systems can seriously effect the performance of any acoustic system. Although not a major issue on electrically powered and relatively slow AUVs, it is a performance limiting factor on ROV tracking. Transducers should therefore be sited as far away from any propulsion unit and hydraulic power plant as possible. In some cases the use of a noise shield can reduce the noise to a manageable level.

Laminar Flow

Turbulent flow due to high speed and wake from the propulsion system can also reduce acoustic performance. In the case of high speed vehicles the positioning of the transducer in a laminar flow region and correct fairing around the transducer face will improve performance. Positioning of the transducer in front of any propulsion system is advantageous to avoid the wake.

Beampattern

The mounting of a transducer on an AUV in respect to the body shell, floatation units, payload and framework can have a dramatic effect on system performance. Here, a compromise has to be made between good acoustic coverage using a protruding transducer, and a recessed transducer with poorer performance, but which is less vulnerable to damage and incurs less drag on the vehicle and hence, increases mission life.

Prototype Testing

Figure 1 shows a prototype body shell that was used in a series of tests to determine the optimum 'compromise' position for a Long BaseLine (LBL) omni-directional transducer.


Fig.1-Test tank trials of an AUV hull

The tests were conducted in one of our own acoustic tanks where a wide range of transducers and shields are readily available.

The acoustic properties of the shell ranged from acoustically translucent to highly reflective depending upon the grazing angle of the sound waves.

The polar plot in Figure 2.1 shows the beampattern produced by a hemispherical transducer mounted too close to the AUV body. As can be seen, the nulls become significant around the horizontal and will cause a loss of signal in that direction. The nulls are greatly reduced when the transducer is proud of the hull (Figure 2.2).

Consultancy

With over 30 years experience and unrivalled R&D resources, Sonardyne is able to offer a wealth of knowledge to AUV and ROV manufacturers during development programmes.

Acoustic modelling was used extensively in the development of AV-Trak to determine system performance prior to detailed design. This, together with subsequent test results, provided the customers with a basic system understanding upon which to plan their AUV trials and operations.

Facilities available include three large acoustic test tanks and a sea trials centre where comprehensive in-water analysis can be undertaken using our own research vessels.