

Modular Multistatic Variable Depth Sonar System

- Hull Mount Sonar
- Directional Active-Passive Receive Array
- High Powered Towed Sonar Source
 - Separate Tow Body, or
 - In-Line Tow
- Proven Sonar Processing Solution
- Torpedo Detection and Countermeasures
- Rapid Environmental Assessment
- Underwater Communication





**INNOVATION
THROUGH
EXPERIENCE**

MMVDS System Overview

Ultra Electronics' Modular Multistatic Variable Sonar System (MMVDS) is based upon decades of experience in the design and supply of both stand alone and fully integrated sonar systems to navies around the world. Our world leading solutions allow for fully embedded networked antisubmarine warfare capability that provides for increased detection ranges and, subsequently, enhanced situational awareness to the at sea commander. As a fully modular solution, the configuration can be tailored to the environment, threat, platform, and budget of the customer. Key features of the MMVDS include:

- A Highly Sensitive Left-Right Ambiguity Resolving Towed QUAD Receive Array;
- A Low Frequency Sonar Source consisting of either;
 - A Vertical Array of Free Flooded Ring (FFR) Projectors, housed in a Hydrodynamically Balanced VDS Tow Body, or
 - A Multi-Element Horizontal Array of Flexensional Projectors, housed in a Reelable In-Line Towed VDS Array Module;
- Multistatic ready, Bistatic and Monostatic Capable Low Frequency Active Mode and Passive Mode Sonar Processing Software;
- A Proven, Intuitive and Accepted Sonar Operator-Machine Interface;
- Available Hull Mounted Sonar;
- Available Torpedo Detection and Countermeasures;
- Available Environmental data gathering Capability;
- Available Underwater Communications Capability;
- Shipboard Winch and Handling System and Tow/Deck Cables;
- Associated Control and Display Equipment; and
- Ship Installation, Integration, and Life Cycle Support.

Left-Right Ambiguity Resolving Towed Quad Receive Array

Ultra Electronics fully-digital Quad ambiguity resolving towed receive array is a passive sonar sensor that provides intrinsic left-right ambiguity resolution during passive towed array operations, as well as, acting as the active receiver during monostatic, bistatic or multistatic scenarios. Rapid resolution of directional ambiguity using the Quad array avoids time consuming ship maneuvers in order to perform target motion analysis; thereby, permitting the at sea commander to rapidly position their force against potential threats. For active operations, the inherent high dynamic range of the Quad array prevents overload of the system due to high source level sonars. In addition, Ultra Electronics' Quad array utilizes non-acoustic sensor information such as heading, temperature, and depth to refine the performance of the receive sensor. Ultra's multi-octave Quad Array also incorporates an Acoustic Intercept Sonar for detection of high frequency signals associated with high resolution sonar systems, as well as, aiding in the detection and avoidance of marine mammals.

This Quad array can also be employed as the detection mechanism for incoming torpedoes. In this case the left-right ambiguity resolution allows the operator to optimally deploy countermeasures against the torpedoes.



Quad Array Deployment



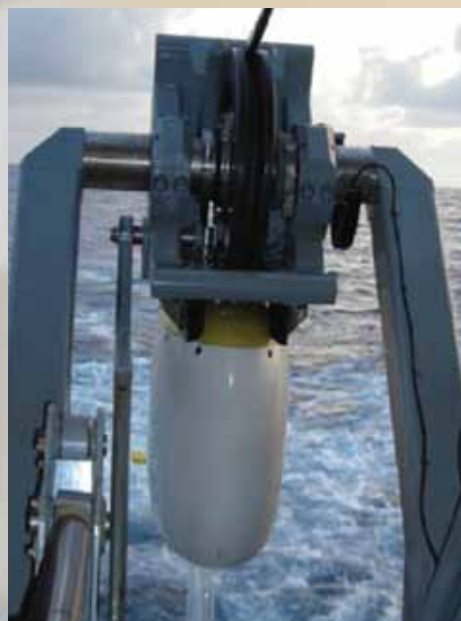
QUAD Directional
Receive Array



Low Frequency Towed Source

Ultra's portfolio of Towed Sonar Source technologies is built upon the innovation and experience gleaned from several decades of research, development and manufacture of active transducers. Most large navies continue to depend on the well-proven, traditional vertical line array composed of Free Flooded Ring (FFR) projectors housed in a tow body deployed in a separate tow from the Active-Passive Towed Receive Array. This approach typically allows for the greatest source level in the water and hence, results in the greatest deep-water detection ranges.

Conversely, small frigates or those operating in coastal regions, or where antisubmarine warfare is not the prime mission of the warship, have opted for a Horizontal Projector Array (HPA). This new, proprietary reelable active transducer technology provides both performance and reliability all in a single tow. The HPA approach results in a low mass, small footprint solution that permits for a simplified handling system. It also imposes fewer ship handling constraints when compared to a traditional tow body.



Hydrodynamic Tow
Body Housing Free
Flooded Rings



Horizontal Projector Array Housing
Flextensional Transducers (Photo courtesy DRDC)



Active-Passive Processing and Display

Ultra Electronics' MMVDS processing and display software has been developed and refined over many years of at sea experience. Both prototype and production passive towed arrays, in concert with low frequency active sonar systems have been utilized extensively to refine and enhance both sonar algorithms and the operator-machine interface. Aside from the well known passive processing and display of quiet subsurface targets of interest, Ultra's active processing software makes maximum use of the pulse modes available in the active sonar source and the beam-forming capabilities of the left-right ambiguity resolving Quad array. Ultra's sonar processing solution employs a modular, open architecture approach, utilizing standard interfaces and protocols. In addition to the standard array of operator tools used to detect and track targets, innovative processing techniques to enhance the probability of early detection and classification have also been developed. Ultra's high performance, active processing algorithms have demonstrated the ability to solve the left-right ambiguity within one ping, which offers a substantial tactical advantage during highly dynamic ASW operations being conducted against a difficult adversary.

Shipboard Winch and Handling System

Ultra Electronics is able to supply a wide range of Winch and Handling Systems in order to meet the operational needs of the end user. Designed as stand-alone systems that easily and seamlessly integrate into the ship structure, Ultra Electronics' lightweight Winch and Handling Systems require only electrical power and cooling water for operation. These systems range from simple, low cost implementations that require personnel in the winch room to effect deployment to fully automated, high-speed systems that can be controlled from the Combat Information Centre. In all instances, extensive use of commercial and military off-the-shelf components ensure a robust and reliable implementation allowing for trouble free operation in the most demanding of environments.



High Speed Winch and Handling System

Torpedo Detection and Countermeasures



Flexible Tow Body

Ultra Electronics is the world leader in torpedo defence with systems currently operational with the UK Royal Navy and about to enter service with the Turkish Navy. Ultra's torpedo defence technology has been extensively trialed by the US Navy and has been selected for use on their new Littoral Combat Ships. With the ability to detect and classify all known torpedoes, including those with advanced countermeasures, Ultra offers a combined expendable and towed countermeasure system to decoy and jam incoming acoustic torpedoes. Using pneumatic launchers to deploy Expendable Acoustic Devices (EADs) in programmable acoustic decoy patterns, Ultra's torpedo countermeasure is easily fitted on most warships and avoids the inherent safety issues associated with explosive launched systems. A flexible towed body is available for export to select countries and permits an active countermeasure jammer to be towed in-line with the active-passive towed receive array. This eliminates the need for a separate winch and handling system normally associated with stand alone towed countermeasures such as Nixie.

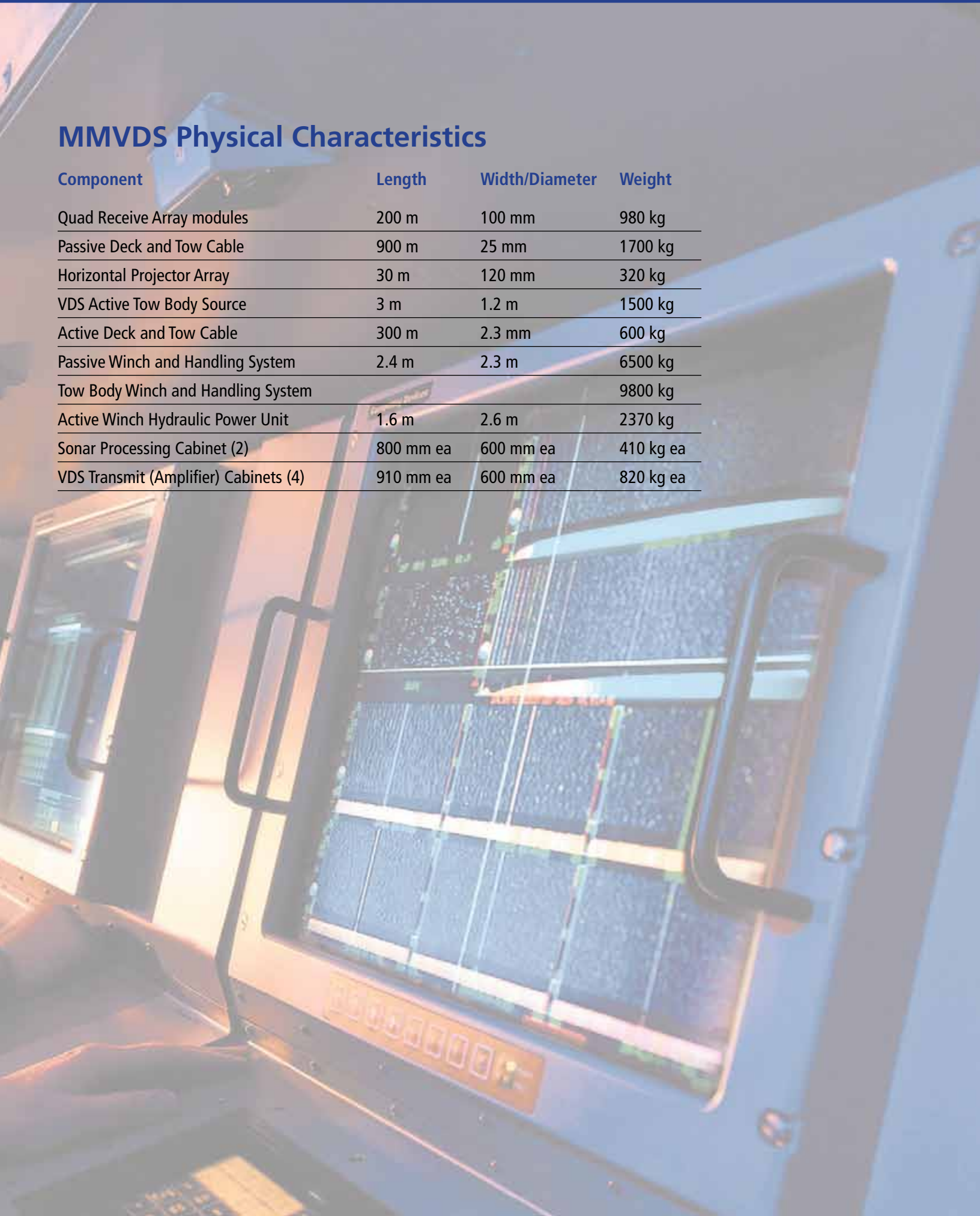
Environmental Assessment and Underwater Communication

Naval sonar operations utilize information from historical databases, as well as, in situ sampling of environmental parameters. The information obtained from these sources is input into sophisticated models capable of estimating sonar performance and the uncertainty in the estimate. The speed and accuracy of these estimates is crucial to mission success. Ultra's Rapid Environmental Assessment (REA) for naval sonar incorporates a GIS-enabled database to manage historical environmental data, measurement tools that operate while underway to provide in situ sampling of water column and seabed properties, and a sensitivity model that examines the relative importance of different environmental parameters in order to produce the best performance estimate for the selected sonar in the existing environment.

Submarines are increasingly required to be integrated with the surface force in order to share situational awareness, plan collaboratively, and fight synergistically with joint and coalition forces. Ultra has significant expertise in underwater networked connectivity having developed its own expendable acoustic modems for subsurface communications and towed high data rate SATCOM systems for long haul communications. Ultra also has experience in integrating third party underwater communications systems into a warship's sonar suite.

MMVDS Physical Characteristics

Component	Length	Width/Diameter	Weight
Quad Receive Array modules	200 m	100 mm	980 kg
Passive Deck and Tow Cable	900 m	25 mm	1700 kg
Horizontal Projector Array	30 m	120 mm	320 kg
VDS Active Tow Body Source	3 m	1.2 m	1500 kg
Active Deck and Tow Cable	300 m	2.3 mm	600 kg
Passive Winch and Handling System	2.4 m	2.3 m	6500 kg
Tow Body Winch and Handling System			9800 kg
Active Winch Hydraulic Power Unit	1.6 m	2.6 m	2370 kg
Sonar Processing Cabinet (2)	800 mm ea	600 mm ea	410 kg ea
VDS Transmit (Amplifier) Cabinets (4)	910 mm ea	600 mm ea	820 kg ea





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