



Fusion 6G[®] continues to be the world's most popular Long BaseLine (LBL) acoustic positioning system by providing the most accurate method for installing subsea structures, tracking ROVs and conducting acoustic metrology. The system operates by measuring acoustic ranges to a seabed array of transponders. The ranges are then passed through a least squares computation to precisely trilaterate a position. As the system utilises a fixed seabed array, the system precision remains the same regardless of water depth.

6G[®] and Wideband 2

Fusion 6G[®] builds on Sonardyne's existing Fusion LBL software to provide support for the latest generation of Sixth Generation (6G[®]) instrumentation platform. Keeping a familiar front end software interface along with fully proven wizards to drive the technology means the switch-over to 6G[®] technology can be considered a low risk process to existing users. When used with Compatt 6 or AMT transponders and a 6G[®] transceiver, operators have access to the latest Sonardyne Wideband[®] 2 acoustic navigation and telemetry options.

Sonardyne Wideband[®] 2 improves on core Wideband 1 technology to provide a more robust solution which can extend the operating capabilities of LBL systems even in the most challenging subsea operating environments.

It allows users to benefit from significant time saving when using the latest Compatt 6 and RovNav 6 equipment which is achieved through a more efficient setup sequence and the ability to perform simultaneous baseline calibrations, dramatically reducing the time taken to calibrate an LBL array. Wideband 2 also allows for signal diagnostics on both telemetry and ranging signals gaining confidence for achieving the correct range which is essential for metrology operations or supplying ranges to aid inertial positioning systems such as Sonardyne's SPRINT.

Fusion 6G LBL[®] at a glance



- Faster setup using high speed telemetry commands
- Data storage and retrieval in Compatt 6 such as installed array co-ordinates
- Real time signal diagnostics for critical application QC
- Faster to calibrate using simultaneous baseline calibration
- 500+ non-interfering unique addresses for field-wide simultaneous operations
- Compatible with previous generation Sonardyne hardware

FUSION 6G[®] LBL

HIGH PRECISION SUBSEA TARGET TRACKING SYSTEM

Simultaneous Baseline Calibration

Before an LBL array can be used for tracking, the positions of the Compatts forming the array need to be known. A baseline calibration procedure involves precisely measuring ranges between each and every Compatt in the array to determine their relative positions.

Traditionally, only a single baseline could be measured at a time due to the requirement for each Compatt to be initiated in baseline collection mode whereby it would measure to a neighbouring Compatt and then telemeter the single range back to the user. With Compatt 6, the user is not required to enable any modes of operation as the Compatt 6 is able to operate in all modes at the same time. As such, a Compatt 6 can range to all other array Compatts simultaneously and then store these ranges prior to them all being telemetered back to the user. This method offers considerable time saving which increases as the array size increases. For example, an eight Compatt array calibration that would have taken over 90 minutes to complete, can now be done in less than 15 minutes. This is over six times faster.

Signal Diagnostics

All received Wideband 2 signals are quantified for signal quality (coefficients) and report all this information to the user as part of the range or telegram message. Fusion 6G[®] is able to use this diagnostic information and report it to the user as simple quality figures. Thus confidence is gained that the direct signal has been detected lowering the risk for acoustic metrology operations. Additionally, these signal quality figures could be used to optimally weight an acoustically aided inertial navigation system.

Multipath Tolerant

With the extra signal length and data bits in a Wideband 2 signal, the effects of multipath are clearer to mitigate against. In addition, the variable power and gain found within 6G[®] instruments also help to reduce the effects of signal multipath. Even if multipath cannot be avoided, Wideband 2 still produces much cleaner and sharper signal correlation compared to previous generations allowing the published ranging accuracy to be maintained for direct signal path.

Faster to Set-up and Calibrate

New simple telemetry commands such as 'Get', 'Set' and 'Sense' have removed the previously complex configuration process for setting up Compatts on the seabed. This means that there is minimal requirement for training for operators as the complexity is now incorporated into the instruments and not the software. Therefore it has got easier, not harder.

Backwards Compatibility

Fusion 6G[®] continues to provide users with support for Compatt 5, RovNav 5 and GDT USBL transceivers. In addition, 6G[®] transceivers are able to set-up and range to 5th generation as well as 6G[®] transponders allowing a seamless migration and backwards compatibility from existing technology.

Scripting Tool

There is also the addition of a new Scripting Tool which allows users to create their own data set which is specific to their requirements. This allows users to gather range and sensor measurements which can either be imported back into Fusion for calibration or exported in a .CSV file for use in external software packages.

Compatt 6

Compatt 6 offers significant time saving using faster and more robust Wideband 2 acoustic ranging and telemetry protocols. This makes any system operating with Compatt 6 significantly easier to operate therefore de-risking operations, reducing vessel time and reducing training requirements for offshore personnel. For example, in one transmission, Compatt 6 tells the navigation system what sensors and functionality it has available as well as its complete configuration.



Backwards Compatibility

Fusion 6G[®] is capable of working in LBL arrays mixed with Compatt 5s and Compatt 6s providing a gradual route and seamless transition onto the new platform. However, the full performance benefits of the new technology can only be gained with exclusively 6G[®] operations.



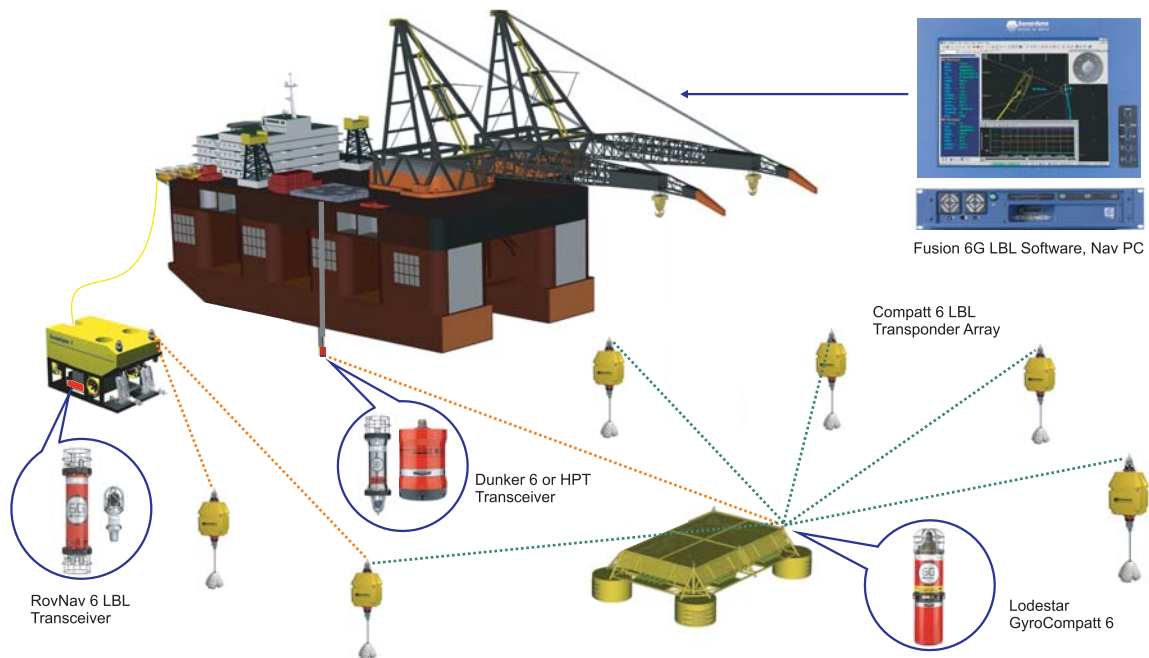
Compatt 6

Compatt 6s stand ready for deployment. The Wideband 2 technology inside it enables faster, more efficient solutions for applications such as spoolpiece metrology and subsea structure placement.



iWand

iWand is a handheld, acoustic transponder test and configuration device for use with 6G LBL hardware.



Compatt 6 also delivers longer ranges. For example, in an extreme deep water isothermal region, Compatts in floats 10 metres off the bottom will achieve ranges of over 2.5km with a horizontal deflection of only 0.2m in a 1/2 knot current. Longer drops will yield even greater ranges.

RovNav 6

RovNav 6 is an LBL ranging and telemetry transceiver specifically designed for installation on work-class ROVs. Its high power output and Sonardyne Wideband® 2 signal processing offers improved range and acoustic performance in challenging conditions such as on noisy vehicles or in multipath environments. The rugged and lightweight omni-directional remote MF transducer makes installation on an ROV easy.

RovNav 6 supports a range of internal sensors including; strain gauge pressure, direct reading sound velocity, PRT temperature and MEMS based inclinometer.

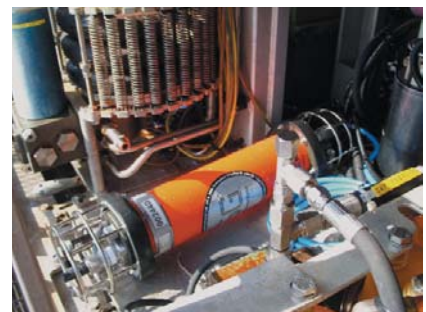
Lodestar GyroCompatt 6

Lodestar GyroCompatt 6 integrates a Compatt 6 transponder and Sonardyne Lodestar INS / AHRS in one small, highly versatile and robust instrument. This provides high update rate wireless attitude, heading, heave, surge, sway, pressure, SV and acoustic positioning of any subsea object. Structure position and orientation can be accurately determined during lowering, set-down and as-built surveys.

Using the Lodestar GyroCompatt 6 for metrology delivers the measurements required for pipe-end coupling. The stab, gyro and transducer are pre-aligned and this speeds up spot measurements as only single observations are required.

Dunker 6

Dunker 6 is a 6G® LBL and telemetry transceiver specifically designed for vessel deployment. The super duplex stainless steel housing and vibration isolated electronics makes for an extremely rugged dunking system. Dunker 6 is fully compatible with Sonardyne's modem and logging equipment such as AMT and Fetch products, allowing it to be used to retrieve data or configure logging regimes.



ROV Transceiver

RovNav 6 is a high power LBL transceiver and USBL responder that also features an integrated modem capability for data download from autonomous monitoring transponders.

GyroCompatt and Dunker 6

GyroCompatt provides high update rate wireless attitude, heading, heave, surge, sway, pressure, SV and positioning of any subsea object. Dunker 6 is a vessel-based positioning and data retrieval transceiver.



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Fusion 6G LBL® System Performance

| | |
|-------------------------|---|
| System Accuracy | Subsea target tracking to centimetric accuracy independent of depth |
| LBL Calibration | Batched baseline and batched simultaneous baseline collection |
| Survey Inputs / Outputs | All industry-standard Survey telegrams and proprietary Sonardyne NMEA |
| Ranging Precision | Better than 0.015m |
| Array Size | 99+ |

Fusion 6G® LBL Equipment List Key: ● = Required ○ = Optional



● Software
 Fusion 6G®
 LBL



○ Software
 6G®
 Terminal Lite



○ Software
 6G®
 Configurator



○ Type 8315
 iWand Hand-
 held Test Device



● Type 8026
 Navigation
 Computer



○ Type 8098
 Navigation
 Controller Unit



○ Type 8309
 Dunker 6 LBL
 Transceiver



● Type 8310
 RovNav 6 LBL
 Transceiver



○ Type 8142
 HPT USBL
 Transceiver



● Type 8300
 Compatt 6 LBL
 Transponder



○ Type 8084
 Lodestar Gyro-
 Compatt 5 or 6



○ Type 8305
 AMT
 Transponder



○ Type 8000
 Compatt 5
 Transponder



○ Type 8010
 RovNav 5 LBL
 Transceiver



○ Type 8021/3
 GDT USBL
 Transceiver

Other Acoustic and Inertial Systems from Sonardyne

- Ranger 2
- Marksman LUSBL
- SPRINT
- DP-INS

Fusion 6G LBL® Key Technology



Sonardyne
 Wideband®
 Wideband 2®

Sonardyne Wideband® 2 is an ultra-wide bandwidth signal architecture exclusively developed for 6G® hardware. Delivering seamless acoustic navigation and telemetry of subsea data, the technology offers a host of benefits; fast and robust transmission of data, precise ranging, wide area coverage, mitigation from multipath signals and greater immunity to noise from vessels and other acoustic systems.



Precision Ranging

Wideband acoustic systems allows precise range measurements to be made quickly and efficiently dramatically shortening the total time of LBL operations whilst guaranteeing confidence in the final results.



Battery Life

Do more for longer. 6G® products are designed using the latest low power electronic architecture saving time and money by not having to recover equipment to recharge or replace transponder battery packs.



High-Speed

Data acquisition time is dramatically shorter for both calibration and measurement phase. Ranges, diagnostics and sensors data is acquired simultaneously to multiple instruments in a fraction of the time previously taken.



Acoustically Aided INS

Seamlessly integrates Sonardyne LBL, USBL and Lodestar INS technologies to offer a combined acoustic and inertial navigation solution suitable for the most demanding subsea tracking and vessel positioning applications.