# Application Note

EM 2040 High Resolution Inspection Multibeam

KONGSBERG

# High Resolution Bathymetry from ROV Mounted EM2040 and HAIN Inertial Navigation


## High resolution and dual pulse design optimises ROV results

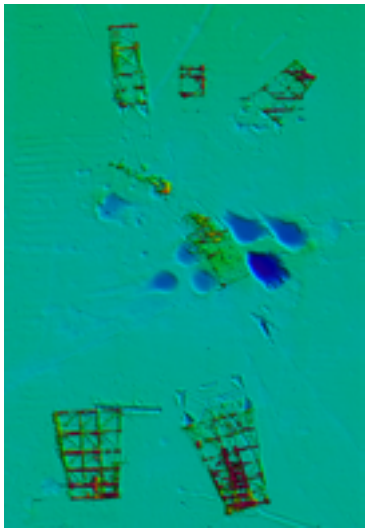
The EM 2040 high resolution multibeam from Kongsberg Maritime brings all the advanced features of deepwater systems to the shallow water market. With a transducer depth rating of 6,000m, the dual pulse EM 2040, used with an ROV, offers an ideal solution for high resolution deepwater bathymetry.

The EM 2040 is readily available for vessels of opportunity and with its simple modular design the integration for ROV use is very straightforward. The lightweight design also allows for easy installation and fast deployment, whether the operational timescale is short-term or more permanent.

By combining the deep water capability of a ROV with the precision offered by the highest resolution multibeam system available on the market allows the operator to obtain better results, faster.

## Ease of integration with Kongsberg inertial navigation for increased accuracy

When the EM 2040 multibeam is integrated with the HAIN inertial navigation system, the resulting data is effortlessly cleaner and requires little to no processing. This reduces both the time and cost spent during the post-processing phase and ensures that results are obtained faster. The synergy existing between Kongsberg developed products means that integration of EM 2040 and HAIN is seamless.



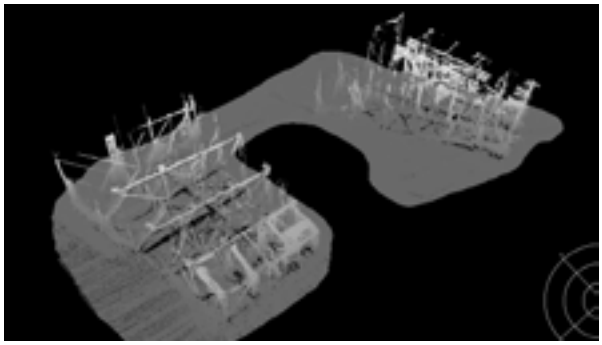
The overview image (left) depicts an artificial reef in the Gulf of Mexico consisting of one standing and several collapsed platforms. The overview survey was conducted at an altitude of 50m from the seafloor, allowing plenty of safe passage for the vehicle while also affording a 220m swath.

Conducting the survey in this manner allows for fast yet high precision coverage. With this the operator can then decide on priority areas before starting inspection work.

Using high resolution equipment, the results allow us to identify field debris in minute detail, including the old platform base (centrally located) and smaller pot marks caused by spud cans during installation, many of which are only centimeters deep.

## High resolution backscatter

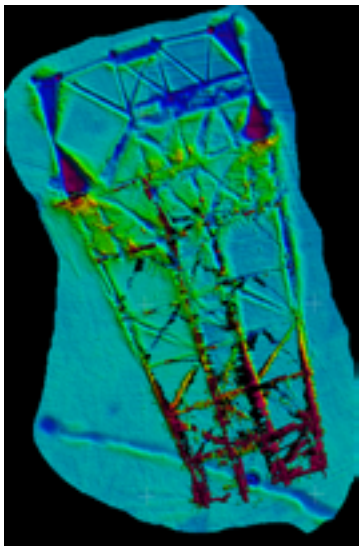
One of the huge benefits with the KM Multibeam system is the high resolution backscatter. On the image across the backscatter has been mosaiced to give a fast overview of the area. Now the 12 inch pipeline becomes extremely clear however we can now also see 8 inch pipelines which have very little bathymetry. The sharp signal returns from pipelines allow us to plot their path accurately and allow further work to be performed in confidence.



## 3D visualisation through post processing

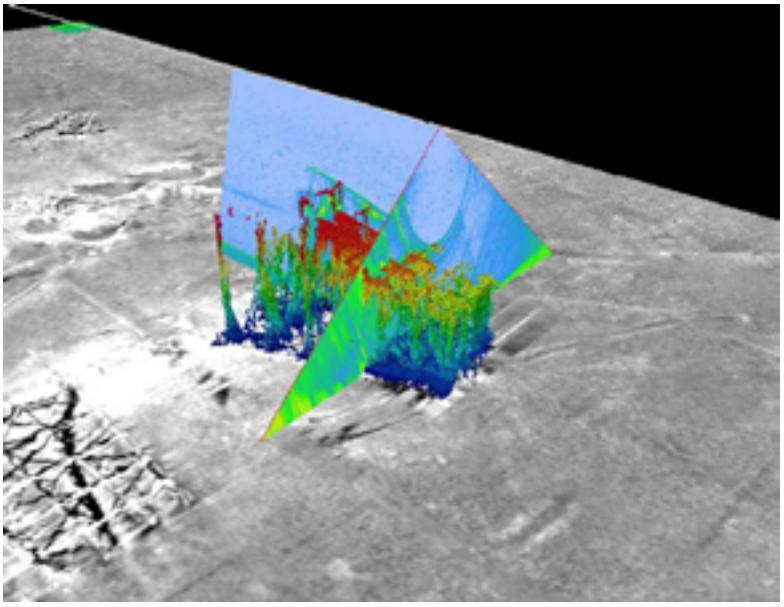
Looking at the south-east platform in more detail (bottom left) we can see the crater left from the foundation when the structure collapsed. This image was created from several passes, however we can see that they merge cleanly.

Viewing the raw data points in 3D (above) we can see that the resultant imagery is very clean and accurate. With little to no processing required, the customer can view the completed results almost immediately after acquisition.



In 3D we can see that the platform is actually clear of the sea floor at its top edge.

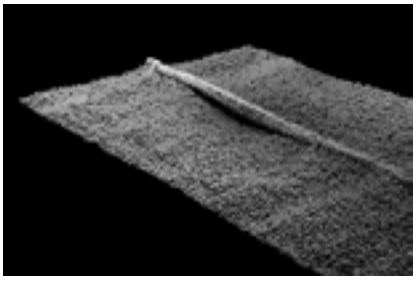
Using algorithms specifically designed for object detection we can identify data points throughout the structure. The cutting edge water column imaging from the EM 2040 allows advanced post processing to ensure that nothing is missed (below).



## Gas pipeline high resolution survey

Using real time operator control, the pipeline survey below was carried out at an altitude of 10m. This allowed incredible data density without the risk of losing the pipeline, hence no repeat survey.

The image shows the 12” pipeline in free span for 8 metres with a scour 20 cm deep. Although this pipeline was not operational it highlights the need for regular high resolution inspections in areas where fast changing topography is expected.



## System specifications and benefits

### Operational specifications

- Operates at 200 - 400KHz
- 0.4 x 0.7 degree angular resolution*
- Dual transmission pulse
- Dual Rx receivers
- Provides unrivalled resolution which gives unmatched sounding density

### Unique projector design

- 200 degree transmission sector
- Allows use of dual receivers with just one transmitter
- No need for two independent systems
- Reduced weight and complexity of installation
- Ensures maximum density along track with dual pulse

### Flexible Multiplexer Integration

- EM 2040 requires standard Gigabit and 100 base T connections
- Can be used with most mutiplexers on the market
- Tested with industry standard Batcom
- Delivered successful results with the new Seatronics Gen5 in above trial

* All examples used EM 2040-07

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