



## 30 KHZ MULTIBEAM ECHO SOUNDER

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The modular, state-of-the-art EM 304 performs accurate, high resolution seabed mapping in shallow to deep waters at depths of more than 8000 m. The successor to the EM 302, the EM 304's broad range of functionality supports simultaneous collection of multiple data types, saving time in the planning, execution and analysis phase. A low noise echo sounder, EM 304 delivers superior data requiring minimal post-processing.

### Modular and flexible design

The EM 304 consist of new state-of-the-art electronics and separate transmit and receive transducers in a Mills Cross configuration. It utilizes the same field-proven transducers as the EM 302, making it easy to upgrade. Care has been taken to design a highly, modular and flexible solution with compact electronics for easier and faster installation. Due to a flexible transducer design, the system can be tailored to almost any required size. The largest standard size, 0.5 x 0.5 degrees, gives the ultimate system performance in terms of resolution and range, while a smaller 4 x 4 degrees solution can be installed on any vessel of opportunity.

### Full seabed coverage

The transmit fan is divided into up to 16 individual sectors in dual swath mode. This allows for unique control of the transmit fan, enabling active stabilization in real time to correct for any yaw and pitch movement of the vessel, while roll stabilization is applied on the receiving beams. The result is a stabilized system for full ensonification of the seabed with equally distributed footprints, even in bad weather conditions, leaving no gaps or holes in the mapped area. All beams are maintained and automatically adjusted according to achievable coverage or operator defined limits. Up to 1600 individual beams are available in dual swath mode. Two individual transmitting fans are generated with a small difference in tilt giving a constant sounding separation alongtrack, resulting in a dense sounding pattern on the seafloor.

### Clean and high resolution data

Due to the sector transmission technique, the system produces a strong dampening of multi-bounce interference from false echo, resulting in significantly cleaner data. Near field beam focus is applied in real time, both during transmission and reception. Due to sector transmission the focal point will be individual for each sector, resulting in a much sharper transmit beam over the entire swath. On reception, the focus is done dynamically for each beam. The result is a much higher resolution representation of the seabed.

### The Kongsberg EM systems

The EM 304 is part of the new EM platform designed for future challenges. The new datagram format supports several new features, such as extended backscatter calibration and more features will be available going forward. The new format is supported by the Kongsberg Kognifai digital open ecosystem.

All Kongsberg EM multibeam echo sounders ensure the best operating environment to safeguard mammals inhabiting the survey area.

## TECHNICAL SPECIFICATIONS AND FEATURES

Feature	
Depth range	10 to more than 8000 metres The depth range depends on water temperature, noise level and bottom type. **
Nominal frequency	30 kHz
Operating frequency	26 - 34 kHz
Swath width	Typically 5.5 times the depth or more than 9 km
Number of swath	2 swaths per ping
Pulse length	0.4 ms CW to 200 ms FM effective pulse length
Number of transmit sectors	16 frequency coded transmit sectors per ping / 8 per swath
Available models (receiver and transmitter)	0.5 degree, 1 degree, 2 degrees and 4 degrees
Number of receiver beams (per ping)	1600 beams, 0.5 degree RX and 1 degree RX 1024 beams, 2 degree RX 512 beams, 4 degree RX
Multi-bounce suppression	Better than 50 dB
Beam focusing	On transmit and receive
Deliverables	Bathymetric data Seabed imagery data Water column data Extra depth detections
Realtime motion stabilization	Roll: $\pm 15$ degrees Pitch: $\pm 10$ degrees Yaw: $\pm 10$ degrees
Sounding pattern	Equidistant and equiangular
Gain control	Automatic
Mammal protection	Gradual start up transmit ramp
New datagram format *.KMall replaces *.all format	
Sub Bottom Profiler integration available	
Compliant to IHO S-44 order 1A	

\* *Vailulu'u Plume*. Image courtesy of Amanda Bittinger, Sunset Hydrographic, LLC. Kongsberg product: EM 302 bathymetry and water column data. Location: American Samoa. Depth: (Plume) 100.2 - 800.7 m (Bathymetry) > 547.1 m.

\*\* 9700 m was achieved by RV Falkor with an EM 302 1 x 1 degree system.

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427739/B December 2017

