

# **HISAS 1030 – High resolution synthetic aperture sonar with bathymetric capabilities**

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## **Abstract:**

Synthetic aperture imaging, a revolutionary technique first developed for airborne radar more than fifty years ago, is now also possible in a challenging environment like the ocean. Synthetic Aperture Sonar (SAS) has become possible due to advances in hardware and software for accurate navigation under water and the availability of stable platforms such as AUVs.

One of the main advantages of SAS is that it is possible to achieve very high along track resolution that can be kept independent of across track range. This is achieved by effectively synthesizing a long antenna by coherent combination of pings taken at intervals along the line of platform motion.

The HISAS 1030 is an interferometric SAS developed by Kongsberg Maritime (KM) in cooperation with the Norwegian Defence Research Establishment (FFI). The sonar is installed onboard HUGIN 1000 MR, a medium size AUV in KM's HUGIN family of AUVs, but is also suited for installation onboard other types of AUVs as well as towed platforms.

For existing technology, such as single beam, multibeam and sidescan sonars, there is always a trade-off between resolution and area coverage rate. The HISAS 1030 is different, in that it can deliver very high resolution images and bathymetry and high area coverage rates, all at the same time.

The HISAS 1030 is capable of providing detailed images with a very high, range independent resolution of approximately 3x3 cm out to a distance of more than 200m from both sides of the vehicle, as well as bathymetric data with a resolution better than 50x50cm out to full range. The area coverage rate depends on the degree of overlap between adjacent survey lines, but a typical value is 2 km<sup>2</sup>/h.

Although primarily developed for demanding military applications such as mine detection and classification, the sonar is also well suited for other applications that require surveying of large areas with high resolution and high area coverage rates. This opens up for a whole range of possible uses such as detailed imaging/documentation of offshore installations, underwater archaeology, mapping of coral reefs, seabed classification and search for small objects on the seafloor.

The first HUGIN 1000 MR fitted with a HISAS 1030 system was delivered to the Royal Norwegian Navy in April 2008 and is currently undergoing a series of tests by the Navy. Another three HUGIN 1000 systems, all fitted with HISAS 1030 have been ordered by the Finnish Navy, with delivery starting next year.

This presentation will give an overview of the main principles and features of the HISAS 1030 system together with results obtained from trials with the system.