



Kelvin Hughes Mk11 SharpEye™

Naval Radar Systems

HENSOLDT UK, formerly known as Kelvin Hughes, is a world leader in the development, manufacture and supply of maritime navigation and surveillance radar systems.

For over 70 years, Kelvin Hughes has supplied navigation radars to naval and commercial shipping users for navigation and surveillance purposes. The SharpEye radar technology has been adopted by over 30 navies, utilising the advanced capability of SharpEye in surface search, navigation and helicopter approach applications.

Technical innovation and engineering excellence are the core values which have built and secured Kelvin Hughes' market position.

Kelvin Hughes pioneered the use of coherent pulse Doppler technologies, making SharpEye radars unbeatable for tracking and identification of small targets in rough weather and clutter situations. The SharpEye technology outperforms in demanding conditions including rough seas, rain, fog and land clutter.

HENSOLDT UK will continue the technical innovation and engineering excellence which were the core values that built and secured Kelvin Hughes' market position.



The SharpEye Advantage

Kelvin Hughes Mk11 SharpEye is a state-of-the-art coherent, pulse Doppler radar for navigation and situational awareness. The ability to see smaller targets in clutter and at greater ranges increases the warship's capability.

Features

- Enhanced detection performance – see smaller targets such as RHIBs and submarine periscopes at greater ranges in clutter.
- Small target detection – can detect targets with a 0.5m² RCS at several nautical miles.
- Clutter removal without picture degradation.
- Pulse compression – provides superior range discrimination across all radar range scales.
- Ultra-high reliability – 100% solid state electronics – NO MAGNETRON – NO MAINTENANCE.

Kelvin Hughes Mk11 SharpEye

Self Contained

Upmast system, no magnetron, no waveguide, no signal loss

Direct Drive Motor

No gearbox, no maintenance, higher reliability

Low TCO

LRU approach, no specialized maintenance training

Anti-corrosion

Carbon fibre - reduced galvanic and sea salt corrosion

Low Install Costs

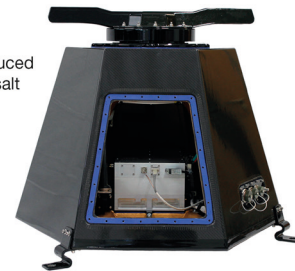
Lift, secure with 3 bolts, plug in 3 sealed connectors

Durability

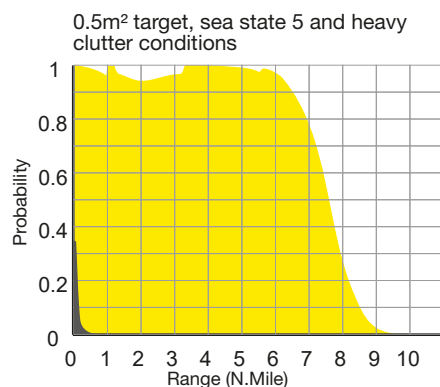
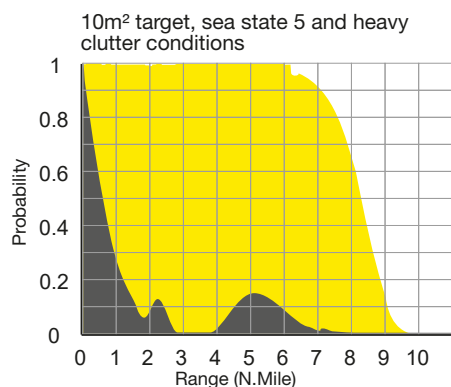
Designed to meet MIL-STD

Lightweight

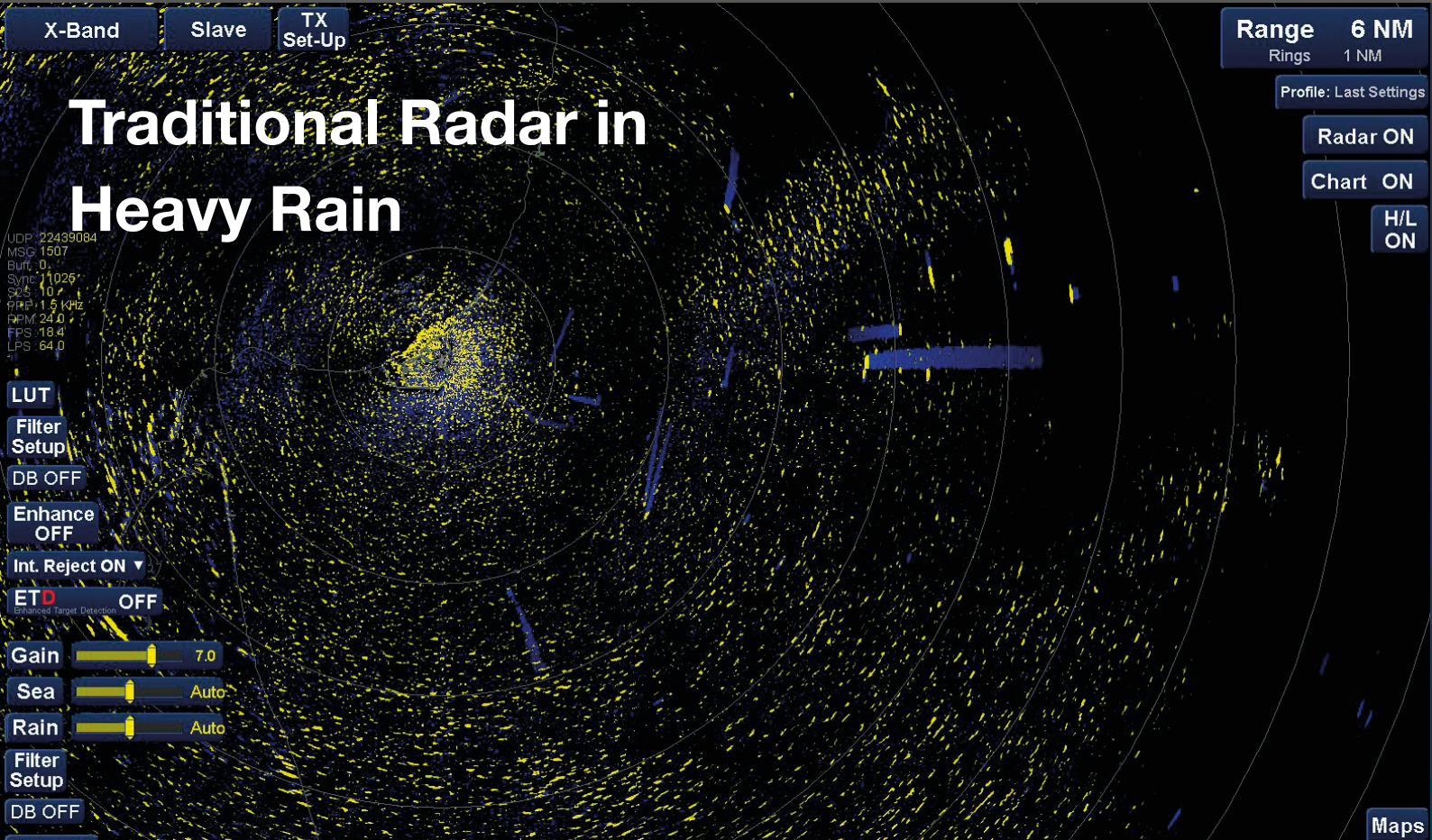
Composite carbon fibre materials



Typical Performance Advantage



■ SharpEye I-band (X-band)
■ Conventional I-and (X-band)



Traditional Radar in Heavy Rain

Kelvin Hughes has developed SharpEye to deliver superior radar performance and reliability. SharpEye is the world's first affordable navigation and surface search pulse Doppler radar sensor offering high reliability, low cost of ownership and much improved detection ranges, especially of small targets in clutter.

SharpEye is defining new standards in surveillance missions at sea, onshore and on land with transmit powers of up to 300W. It is used by navies, vessel traffic services, border agencies, coastal surveillance, other security agencies and critical infrastructure operators.

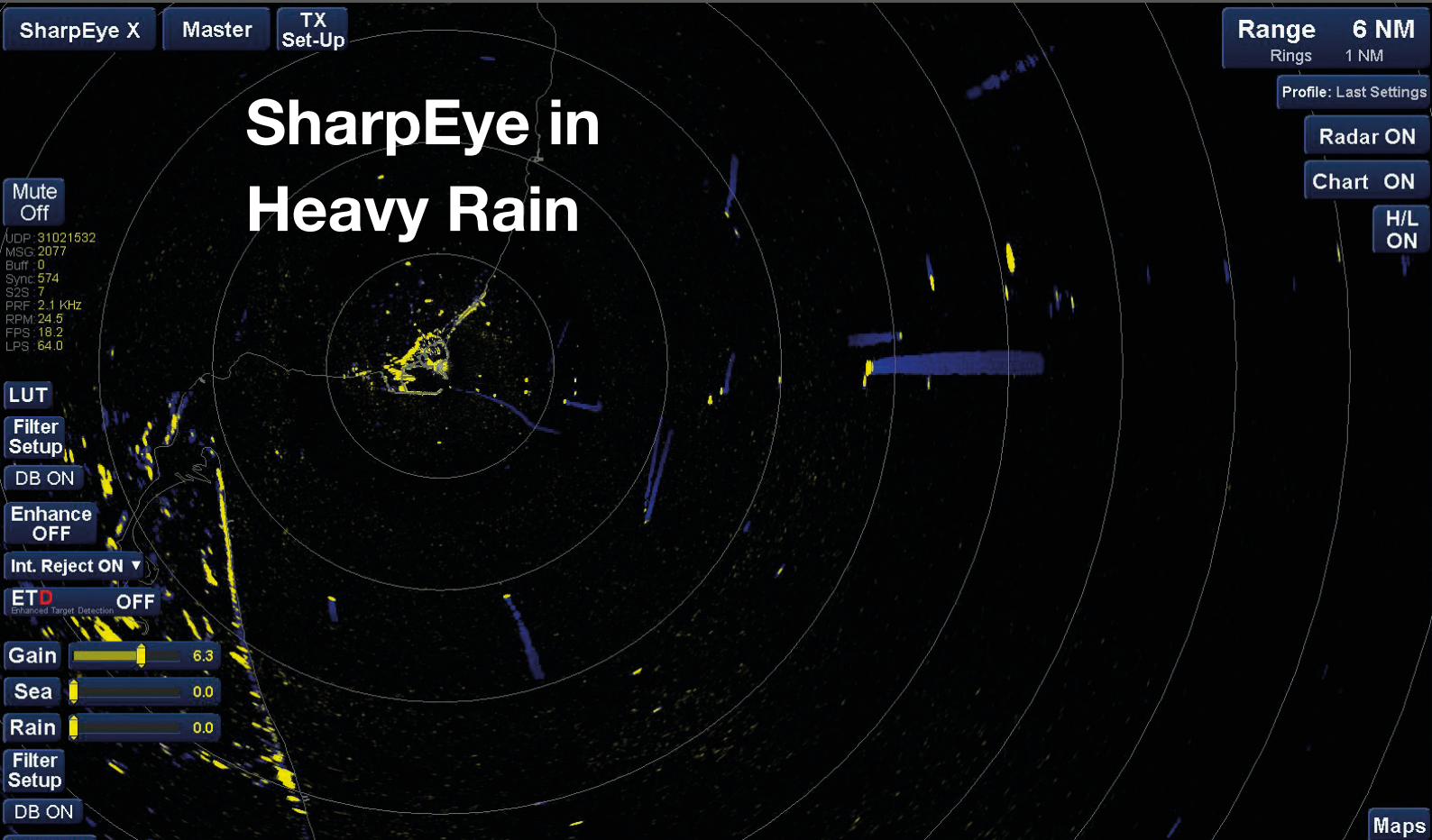
Mk11 SharpEye I-band (X-band) and E/F-band (S-band) technology is a fully coherent radar providing situational awareness in all weather conditions and in high sea states.

Mk11 SharpEye I-band (X-band) transmitters are the first in their class to employ GaN (Gallium Nitride) power transistor technology. The significant performance benefits of GaN transistors have been harnessed by SharpEye to directly improve the performance of the radar.

SharpEye technology uses the Doppler effect to determine target radial velocities. This is achieved by processing received echoes into velocity bands, enabling the separation of genuine targets from clutter. Extracting the relative motion of targets by measuring the phase of the received echo relative to the phase of the transmission enables the radial velocity to be determined.

Mk11 SharpEye advantages:

- Much improved radar performance.
- Inherent reliability.
- Range discrimination is maintained over all radar range scales and is equivalent to that obtained in the short pulse in a magnetron radar.
- Low peak power reduces the probability of intercept.
- Graceful degradation.
- Fast switch-on.
- Long maintenance free service life.
- Tuning/retuning not required.
- Interoperability through frequency selection.
- Reduced risk of interference from other radars.
- Built in test equipment for fault detection and diagnosis.



Benefits	
Value	Advanced capability Affordable Low cost of ownership
Ultra-high reliability	Solid state electronics Graceful degradation Minimum moving components
Clutter suppression	Doppler processing Small target detection
Incremental capability	Capability enhancements Mission updates Useful life extension

Features	
Low power	Reduced ESM signature
Continuous health monitor	Built-in self test system status monitor
Open architecture	Independent display options Camera/sensor interface via display Fibre optic gigabit ethernet (Asterix) Serial I/O via converters
Fully coherent	Patented pulse sequence Doppler processing Moving Target detection Pulse compression ratios up to 1000:1

Specification			
		I-band (X-band)	E/F-band (S-band)
Transceiver	Solid state coherent upmast and downmast options		
	Peak RF power	Up to 300W	Up to 200W
	Power amplifier technology	GaN	LD MOS
	Pulse lengths	0.1µs - 100µs	0.1µs - 100µs
	Reliability	Up to 150,000 hrs MTBF	Up to 150,000 hrs MTBF
Signal Processor	Pulse compression with Doppler processing for:		
	Clutter discrimination	Up to 16 filters	Up to 32 filters
	Automatic, adaptive clutter suppression	Standard	Standard
	Sectorised transmission/processing modes	Optional	Optional
	Doppler	Standard	Standard

Naval Radar Display

Radar Display

The standard radar navigation display is type approved to the latest IMO radar performance standards. Features include an Enhanced Target Detection (ETD) mode that eases the operator's ability to differentiate between clutter and targets and a dual Plan Position Indicator (PPI) mode that provides the operator with two independently configurable PPIs. Tactical features are available in non-IMO mode.

The Kelvin Hughes radar display is a software centric platform enabling it to be updated and additional functionality added in the future.

Features
Ship data
AIS target information
Routes
User defined profiles
Target association, vectors and past positions
Target display and tote table
Steering information*
Dynamic clutter
Depth display*
Single or dual Plan Position Indicator (PPI) for enhanced situational awareness
ARPA (Automatic Radar Plotting Aid) 200 Contact tracker Automatic contact acquisition zones Polyzone acquisition exclusion zones Tote table
Agile tracker option
Integral simulator
Personal setup data
Spyscope
Radar sensor control
Serial and analogue interfaces
Ground stabilised user mapping
Route display with indication of cross track error
Man-overboard marker with drift compensation and elapsed time indicator
Parallel index lines
Electronic tape measure for rapid range and bearing calculation
Common reference point
Two electronic bearing lines
Two variable range markers
Displays official Electronic Navigation Charts (ENCs)
Route planning and monitoring
ARPA/AIS contact correlation

* subject to compatible interfaces

The naval tactical radar display brings the processing advantages of the SharpEye radar transceiver to life. The integrated radar display is part of a fully redundant networked system and is type approved (MSC.192(79) / IEC 62388 Ed.2).

User Experience

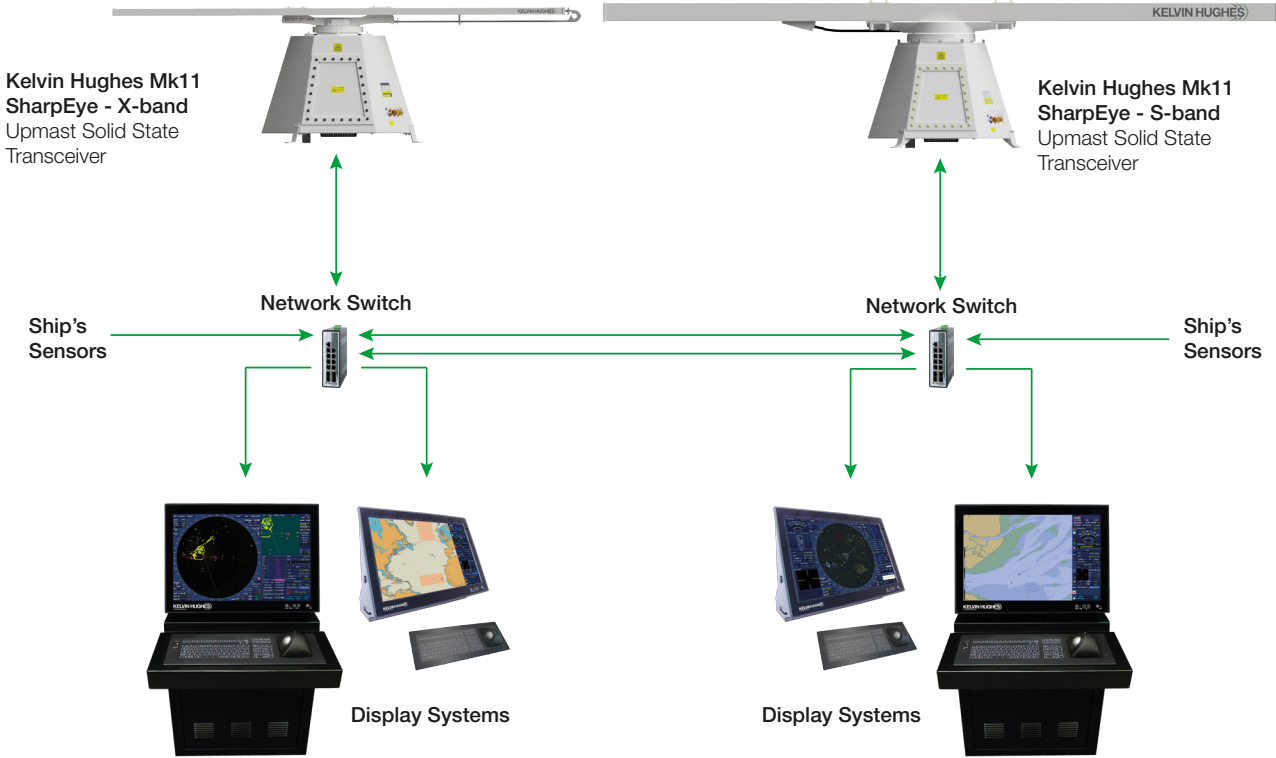
- Providing a single platform for radar, chart radar and ECDIS.
- Easy to use and intuitive, with on screen prompts to assist the user.
- Open architecture enabling serial and digital interfaces.
- Twin PPI enables the user to build a complex picture on one PPI while leaving the other clear for collision avoidance.
- ETD mode provides a clearer picture and uses colour to differentiate between moving and stationary targets.
- ETD also helps the user to detect targets before they are strong enough to be tracked.
- WECDIS integration.

Benefits

- Ease of operation.
- Decision making tool, that enhances safety and efficiency at sea.
- Manage the interface picture and share information across workstations.
- Dual PPI display and ETD enhance situational awareness.
- Tactical functionality developed with the naval operator in mind.

SharpEye Transceiver	
Transmitter type	Solid state
Low power	Up to 300W
Solid state pulse Doppler	
Upmast	
Onboard preprocessing	
No maintenance required	
Low through life costs	
Navigation and tactical short and long range surveillance	
Simultaneous long and short range operation	
Pulse Doppler processing for rain and sea clutter rejection	
Built-in system monitor	

System Configuration



Naval Tactical Display

High resolution screens	1920 x 1200 LED
High Definition	24" and 26"
Console Mount	Integrated processor
Naval Tactical Features	Enhanced Target Detection (ETD) Chart radar Dual PPI Helicopter control
Interfaces	Serial and Digital
Tracker Options	ARPA Agile
Operates as standalone or across workstations	

Antennas

Standard antenna types include 2.5m and 3.9m low profile designs to reduce wind loading

Optional Tactical Features

Helicopter approach path
Electro Optical Fire Control System (EOFCS) interface
Jamming detection mode
Relative velocity calculations
Anti-submarine warfare - FOC, running torpedo (dogbox), plan cordons
Navplans/blind pilotage
Sector transmission/single scan
Sector screens and plan cordon
North stabilised transmission sector
MRATS (Manual Rate Aided Track Facility) and synthetic target
Operator track labelling
Operator target identification

Contact

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