



ELECTRONICS DIVISION

KRONOS® GRAND NAVAL

NAVAL MULTIFUNCTIONAL ACTIVE RADAR FOR PRINCIPAL ANTI-AIR MISSILE SYSTEM

KRONOS® Grand Naval is multifunctional radar based on advanced Active Electronically Scanned Array (AESA) technology, used as main radar for the Principal Anti-Air Missile System (PAAMS). KRONOS Grand Naval applications include extended self-defence, air and surface surveillance and simultaneous multiple targets tracking, volumetric search and multiple missiles guidance.

THE SOLUTION

KRONOS Grand Naval is the most advanced 3D naval radar worldwide, demonstrated by a range of trials on board the FREMM class vessels. Its multifunctional capability enables heavy combatants, such as frigates and destroyers, to perform naval warfighting missions, including extended self-defence and area protection in complex scenarios against multiple attacks in very severe clutter and jammer environments.

Being fully solid-state and with redundancy for all equipments, it offers an unrivalled high reliability of the system.

KRONOS Grand Naval uses its multifunctional capability to simultaneously and independently perform surveillance and targets tracking by electronically scanning the beam both in azimuth and elevation, in addition to mechanical rotation. The system offers high-performance ECCM features.

KEY FEATURES

KRONOS Grand Naval is the main system of the PAAMS. PAAMS is a 360° omni-directional system providing multilayer air defence to surface group warships or groups of unarmed support and merchant ships. It includes three separate roles in a single naval air defence system: ship self-defence for warship protection; naval area defence for protection of nearby ships; and fleet protection at medium and long range.

KRONOS Grand Naval is based on the company's extensive experience in the development of multifunctional radar systems. This began more than 20 years ago with the multifunctional radar EMPAR, which was then installed on the French/Italian Destroyers (Horizon) and Italian Aircraft Carrier (Cavour).

It encompassed the main missions of self/area defence through to active missile guidance (ASTER15/30). In service since 1985, EMPAR has successfully performed more than ten formal ASTER missile firing and more than 100 formal trials with cooperative targets (low level UAV and missiles, high diving missiles, helicopters, aircraft and ships). While maintaining the same capabilities and configuration of the Radar Management Computer, the company inserted new solid-state technology in the antenna based on Transmitter Receiver Modules in the EMPAR's antenna architecture designing KRONOS Grand Naval.

KRONOS Grand Naval offers multifunctional capabilities with:

- AESA technology, developed within the in-house foundry
- Designed to be the sole radar on heavy combatants ships
- Long-range surveillance to perform area protection and extended self-defence
- Integrated with ASTER missiles launcher, qualified via several live firings
- Multi-beam surveillance for optimized dwell-time over full sector with dynamic and adaptive beam forming
- Extremely fast reaction times to manage response to a wide spectrum of present and future threats, and minimizing delays in the tracks initializations
- Ease of maintainability through TRMs plug-in features, and graceful degradation.

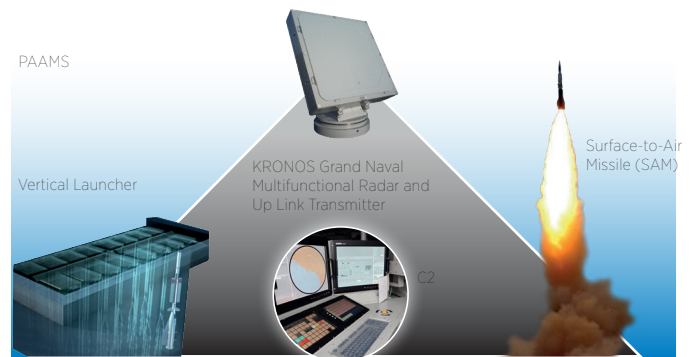
THE SYSTEM

KRONOS Grand Naval performs the following main tasks:

- Air and surface surveillance, search and dedicated tracking with very high elevation coverage to counter high diving missile threats
- Threats Evaluation with different Update Tracking rates
- Priorities assignments depending on the danger of the threats
- Simultaneous multi-tracking capability for active missiles guidance (e.g., missiles guidance of up to 16 ASTER simultaneously) against missile threats in saturation attacks
- Dedicated tracking against small and low visible target or pop-up targets, such as Sea Skimmer missiles
- Side Lobe Blanking (SLB) and side lobes lower than 40dB
- Emission CONTROL (EMCON)
- Jam strobe detection and tracking

Unlike traditional 3D radars, KRONOS Grand Naval automatically schedules and performs any activity classified as a priority within the current scenario by scanning the beam both in azimuth ($\pm 45^\circ$) and elevation ($\pm 60^\circ$), while mechanically rotating at 60rpm.

KRONOS Grand Naval can be easily integrated in a



multilayered defence system, such as a combat system, providing the following operational advantages:

Shortest reaction time for track initialization. After the initial detection of a new threat, KRONOS® Grand Naval confirms the threat in the same rotation scan, initializing the track within the next mechanical scan. This capability is essential against pop-up targets, such as Sea Skimmer missiles and helicopters.

Shortest reaction time for both tracks cueing and engagements

KRONOS Grand Naval performs a dedicated tracking with an update period of 1 second for threats classified as HPT (High Priority Tracking), reaching the accuracy required by a fire control tracking radar in a very short time combining beams through the scan off capability. All these features provide increased reaction capability reducing times in the overall combat system engagement chain.

TECHNICAL SPECIFICATIONS

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|-----------------------------------|---|
| • Operating band | C-Band |
| • Antenna technology | Active Full Phased Array, TX RX solid state modules |
| • Antenna rotation speed | 60rpm |
| • Electronic scanning capability | $\pm 45^\circ$ Az, $\pm 60^\circ$ El |
| • Maximum Surveillance range | > 300Km |
| • Mechanical Rotation speed | 1 second |
| • Elevation coverage | Up to 85° in tracking |
| • Number of tracks | >300 |
| • Uplink transmission | For precise active missile guidance |
| • Integrated IFF and SLB antennas | 4 channels for primary radar and 2 channels for secondary radar available |
| • MTBCF | >3000h |
| • MTTR | <45 min (TRM plug-in) |
| • EMI/EMC | Qualified MIL-STD-461E |
| • Climatic environment | Qualified MIL-STD-810F |
| • Mechanical | Qualified MIL-STD-167-1A |

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