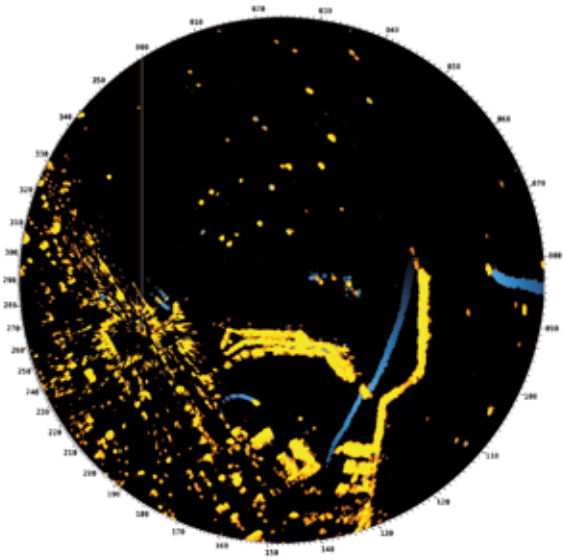
GEM elettronica

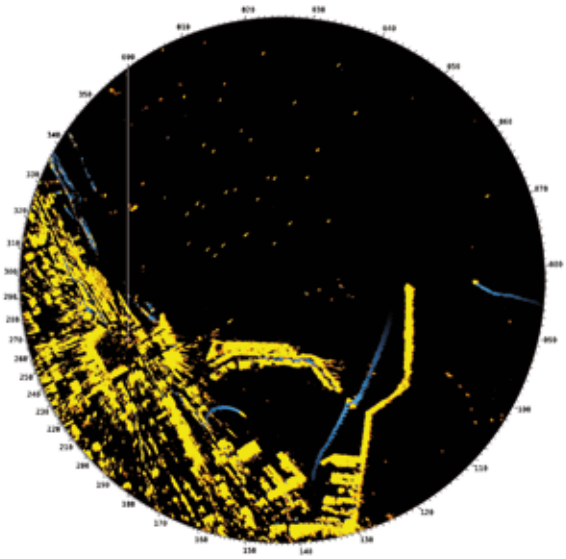
GEMINI-DB SSR

DIGITAL DUAL BAND SOLID STATE RADAR SYSTEMS

X-BAND



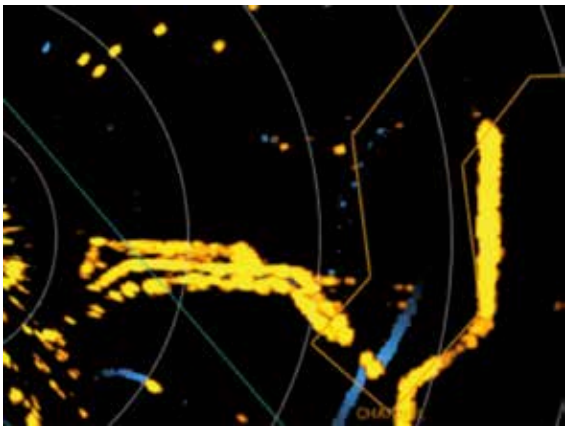
K_a-BAND



GEMINI-DB/SSR digital dual-band solid state radar offers operational advantages and flexibility of operations thanks to the simultaneous use of X and K_a-band frequencies.

GEMINI-DB/SSR can be either used in stand-alone configuration or integrated into other systems or networks:

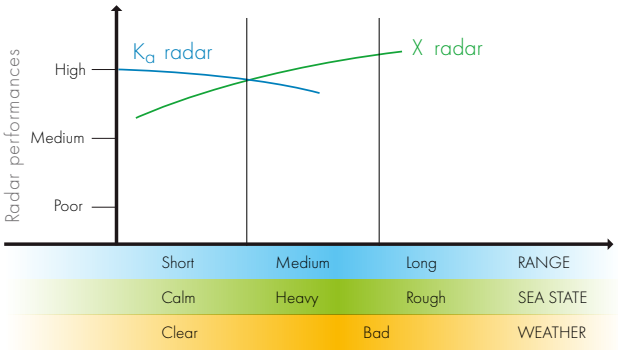
- Navigation stand-alone marine ARPA radar or interfaced with integrated Bridge Systems
- Port Security or surveillance of critical infrastructures (off-shore platforms, nuclear power plants, oil refineries, etc.)
- SMGCS (Surface Movement Guidance and Control Systems) for airport ground control
- "Gap-Filler" radar in conjunction with a primary surveillance radar sensors
- Primary radar sensor to detect small surface targets using its outstanding azimuth and range discrimination



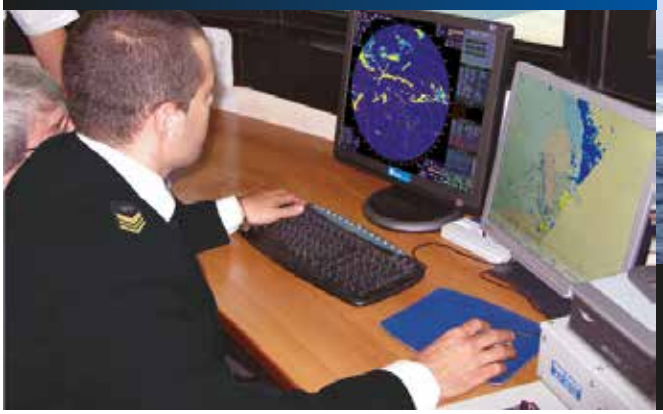
Three modes of independent operations:

1. X-band
2. K_a-band
3. Combined X and K_a-band

GEMINI-DB/SSR simultaneously use X and K_a-band frequencies to allow seamless coverage of surveillance area.



US NAVY has recently acquired and successfully tested GEMINI-DB/SSR radar in sea trials along the coast of California.



Italian Navy successfully tested and employed GEMINI-DB/SSR radar for interdiction and search-and-rescue missions in the Mediterranean.

GEMINI-DB/SSR delivers superior target detection and discrimination at an optimized cost/performance ratio.

GEMINI-DB/SSR complies with the following regulations for X-Band Maritime navigation and radio communication equipment and Systems.

- IEC 60945
- IEC 60936-1
- IEC 60872-1
- IEC 61162-1

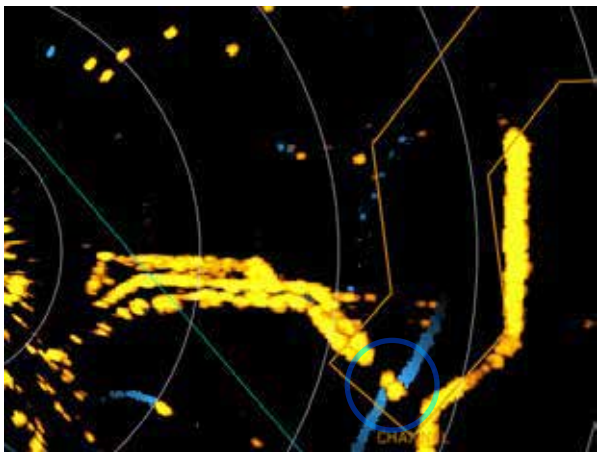
X K_a X-K_a

X

Advanced Fully Solid State Digital Radar sensor

Main features:

- Frequency Diversity
- Accurate target detection
- Coherent, pulse compression, Doppler, digital signal processing, clutter rejection
- Active and Passive Built-In-Test (BIT) for immediate fault localization in support of all-level maintenance activities



X-band not able to separate targets properly

K_a

Highly-discriminating digital K_a-band radar sensor

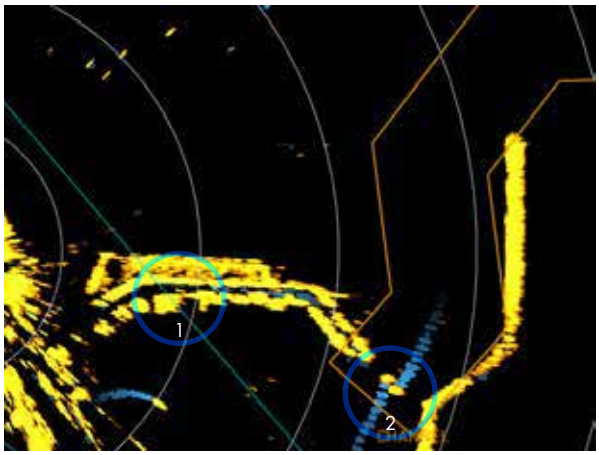
The high sensitivity of the receiver and resolution of the

K_a-band super-directive antenna allows excellent performance also

- To detect very fast small target
- To detect submarines periscopes
- To discriminate very close targets (up to 2 m distances)
- To increase the safety of the ship in every operative condition

special operations:

- Narrow waterways
- Port Approach Control systems with security missions



❶ Identify very small targets immersed in clutter

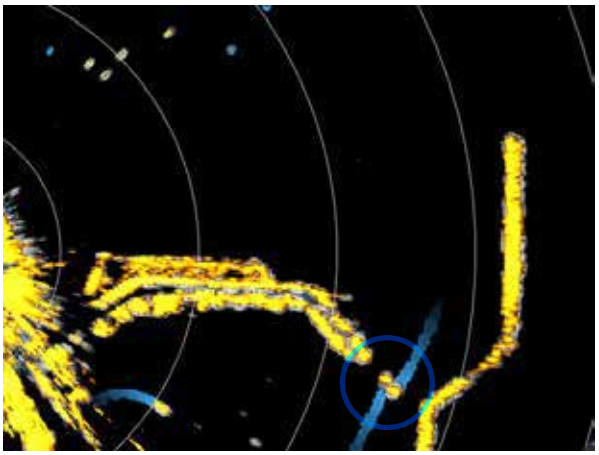
❷ K_a-band able to separate targets

X-K_a

GEMINI-DB/SSR provides clear and unmatchable targets definition.
Large set of functions are available to the operator through an extremely friendly user interface.

Procedures and operational modes are selected in the screen through trackball:

- All basic radar settings (FTC, STC, Tune, Gain, interfence rejection, PRF-PW)
- On-screen graphics (EBL, VRM, cursor a position, navigation graphics)
- ARPA processing is also performed using X, Ka or X-Ka mode.
- Navigation mode including true motion AIS track superposition and fusion
- Track data available on LAN for CMS



Combined radar video is able to separate and mantain proper detection with both bands

GEMINI-DB SSR

Digital filters configuration
- Video Intensifier
- Interference Rejection
- False Alarm Reduction
- Echo Stretch
- Compression type
- Doppler

Radar display settings
- Scale - Rings distance - Display Source: Radar or Simulation - Radar image orientation - Motion - Stabilization source - Stabilization: sea, ground - Selected video - Antenna type - Pulse

Parallel index
The System provides a set of parallel index lines (PI) to be used to set a flexible range and bearing reference to own ship. Parallel index lines are index lines which are parallel to own ship heading and /or to each other.

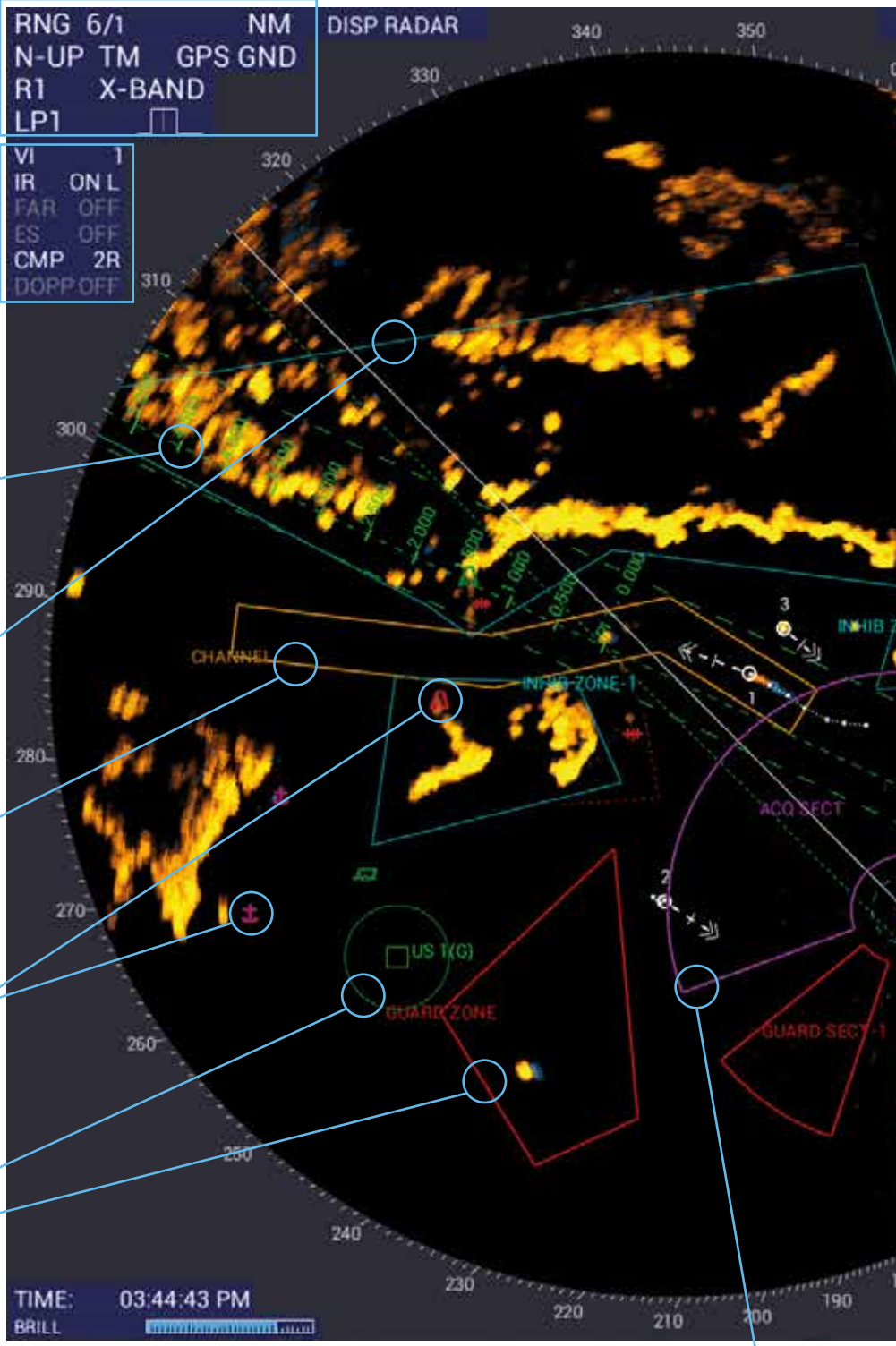
Automatic acquisition inhibition zone

Navigation Channel
Navigation channel function will facilitate the navigation inside a waterway channel. Specific alarms are associated with the navigation channel function

Map objects

User icons
Define the positions and areas of use of the operator.

Sector guard zone
When enabled, it generates the following alarms for all targets or radar tracks entering, passing through or detected within the guard zone:
– continuous acoustic alarm;
– message in the ALARMS window;
– Symbol of acquired target becomes red.



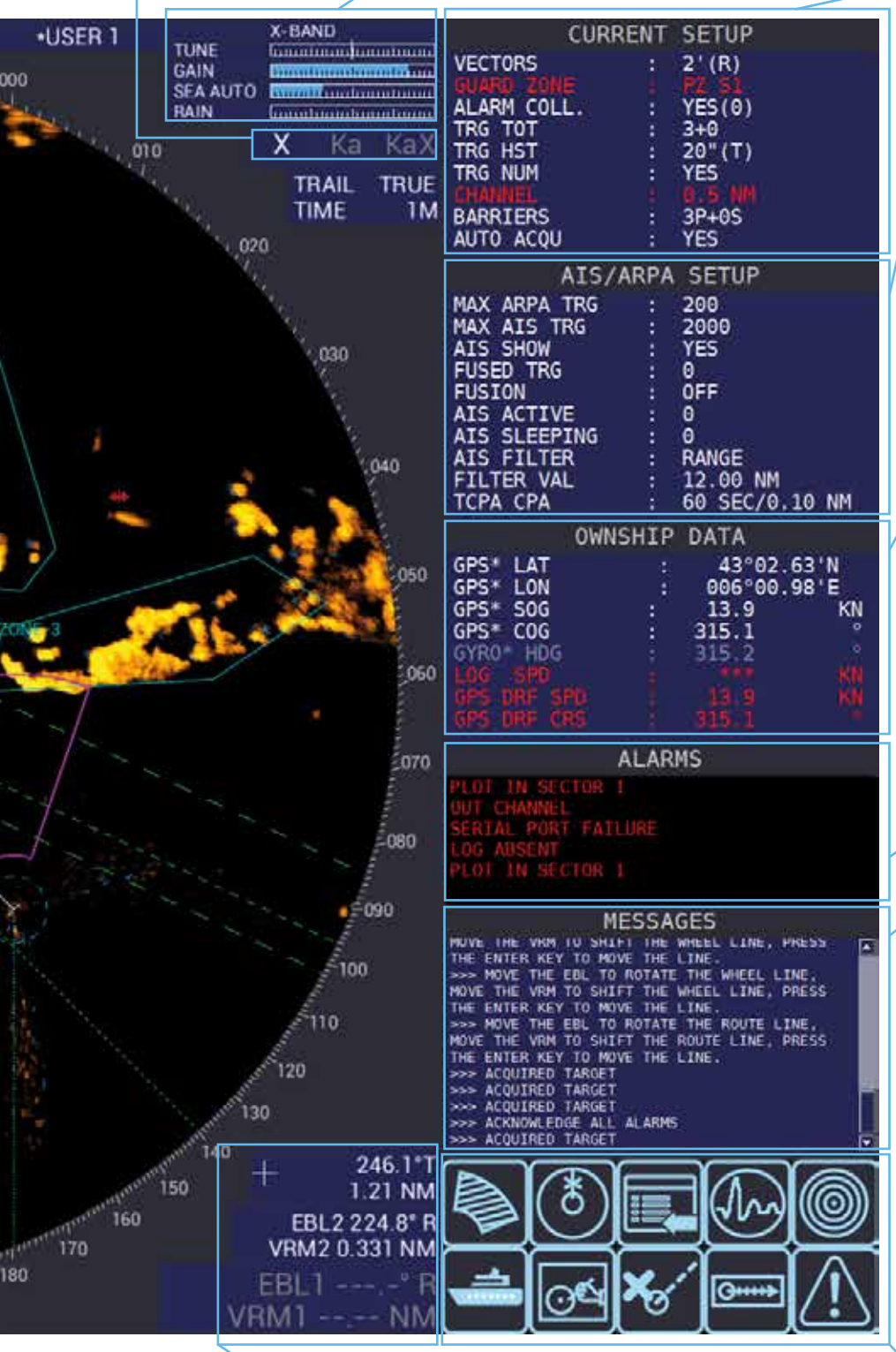
Automatic acquisition area
The plot detected within this zone are tracked automatically without operator action required.

Video channel selection
- X
- K_a
- X, K_a combined

Filter status
- Tune and tune control
- Gain control
- STC control
- FTC control

Current setup

AIS/ARPA Setup
The System provides a function that correlates ARPA and AIS targets based upon a correlation algorithm that takes into account course/speed difference and distance between the two targets.



Ownship data
- Latitude and data source
- Longitude and data source
- Absolute speed and data source
- Course and data source
- Heading and data source
- Speed and data source
- Drift speed and data source
- Drift course and data source

Alarms window
In this window are displayed the main alarm messages generated by the radar; the top rows are dedicated to the most important alarms whereas the last row is used to report the last alarm received.

Messages window
Main messages generated by the System to:
- advise the operator about the outcome of his/her operations;
- Provide instruction to the operator to perform the selected procedure. In this case, the window background switches between light and dark blue until the function is ended;
- show the causes that prevented the execution of a requested operation.

EBL / VRM and cursor data
(range, bearing, latitude and longitude)

Screen shortcuts area
Operating panel for quick access to:
auto acquis. - HL off - menu - pulse - ppi cent - ownship - plot - delete target - vector time - select alarm

ANTENNAS AND ROTATING UNIT

	X	K_a
Antenna type slotted waveguide array		
Lenght	9 feet	8 feet
Polarization	horizontal	circular
Horizontal beamwidth to -3dB	≤ 0.9°	≤ 0.26°
Vertical beamwidth to -3dB	< 25°	< 7.5°
Sidelobes within 10°	less than - 26 dB	
Sidelobes outside 10°	less than - 30 dB	
Gain	31 dBi ± 0.5 dB	40 dBic ± 0.5 dB
Rotation speed	22/11 rpm (depending on range selected)	
Tolerable relative wind speed	100 knots (operative) - 120 Knots (non operative)	

TRANSMITTERS

	X	K_a
Peak power (nominal)	50, 100, 200, 400 W (Fully Solid State)	40 W (Fully Solid State)
Frequency	between 9,300 and 9,500 MHz	between 33,600 and 34,100 MHz
Pulse widths and PRFs:	from 0.05 to 93 µs; from 350 to 2500 Hz	from 0.05 to 12 µs; 3500 Hz
Sector blanking	available	

RECEIVERS

	X	K_a
Type	Coherent with pulse compression processing	
I.F. bandwidth	up to 30 MHz	
Dynamic range (nominal)	> 120 dB (> 130 dB with optional RF STC)	> 100 dB

DISPLAY UNIT

Presentation	MMI and symbols and colours as per IMO/IHO recommendations, 23" colour LCD

X

K_a

Range scale (n. miles)	0.0625	0.125	0.25	0.5	0.75	1.5	3	6	12	24	48	72	96
Ring spacing (n. miles)	0.0312	0.0625	0.125	0.125	0.125	0.25	0.5	1	2	4	8	12	16
Rings	2			4	6								

Range discrimination	better than 20 m on 10 m² target with short pulse
Azimuth discrimination	better than 1.0° (X-band), better than 0.4° (K_a-band)

INTERFACES

Input signals

- GEM's Fiber Optic Gyrocompass (FOG) series or equivalent laser-based gyrocompass: digital, standard NMEA0183;
- Positioning Systems: Digital, standard NMEA0183 for radio navigation and satellite systems (NAVSTAR GPS / OMEGA TRANSIT / LORAN C etc.);
- Log: Digital, standard NMEA0183;
- AIS: Digital, standard NMEA0183;
- TLC (reserved to future use): Digital, standard NMEA0183.

Output signals

- Bidirectional RS422 serial lines (one of them can be set as RS232, configurable) to provide target data;
- RS-343 standard RGB signal for repeater monitor;
- Digital outputs, open collector;
- Ethernet LAN 100 MB, for radar video distribution.

POWER REQUIREMENTS

Input Voltage	115 Vac, 50 ÷ 60 Hz, 1 **Φ** (220 Vac accepted on request)
Power absorption	≤ 1500 W

ENVIRONMENTAL PERFORMANCE

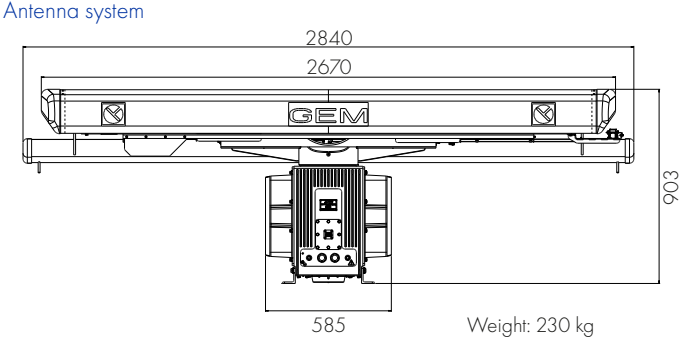
As per IEC 60945 standard:

Temperature	internal units	from - 15°C to + 55°C
	external units	from - 25°C to + 55°C
	storage	from - 30°C to + 70°C
Humidity	93% at 40°C non-condensing (up to 100% at + 40°C with de-hydrator)	
Vibrations	sweep 2 Hz ÷ 13.2 Hz at ± 1 mm / 13.2 Hz ÷ 100 Hz at 7 m/s² and for 2 h on each resonance, otherwise 2 h at 30 Hz in all three axes	
Shock	6 drops from 1 m	
Enclosure	IP65 waterproof	

GEMINI-DB SSR

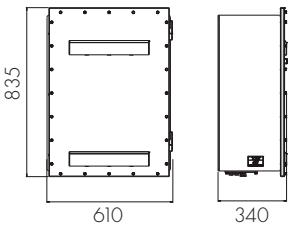
OUTLINE DRAWINGS - all dimensions are in mm

Antenna system



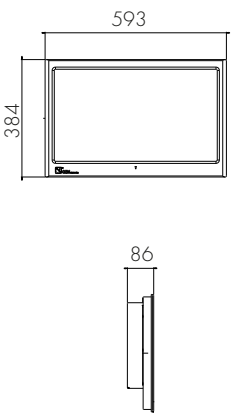
Weight: 230 kg

X-band Downmast transceiver



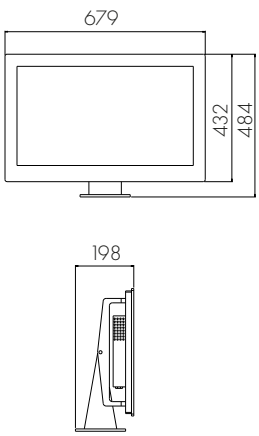
Weight: 55 kg

24" Monitor



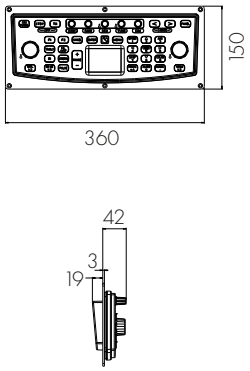
Weight: 22 kg

27" Monitor



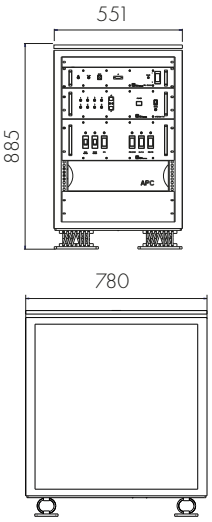
Weight: 25 kg

Keyboard

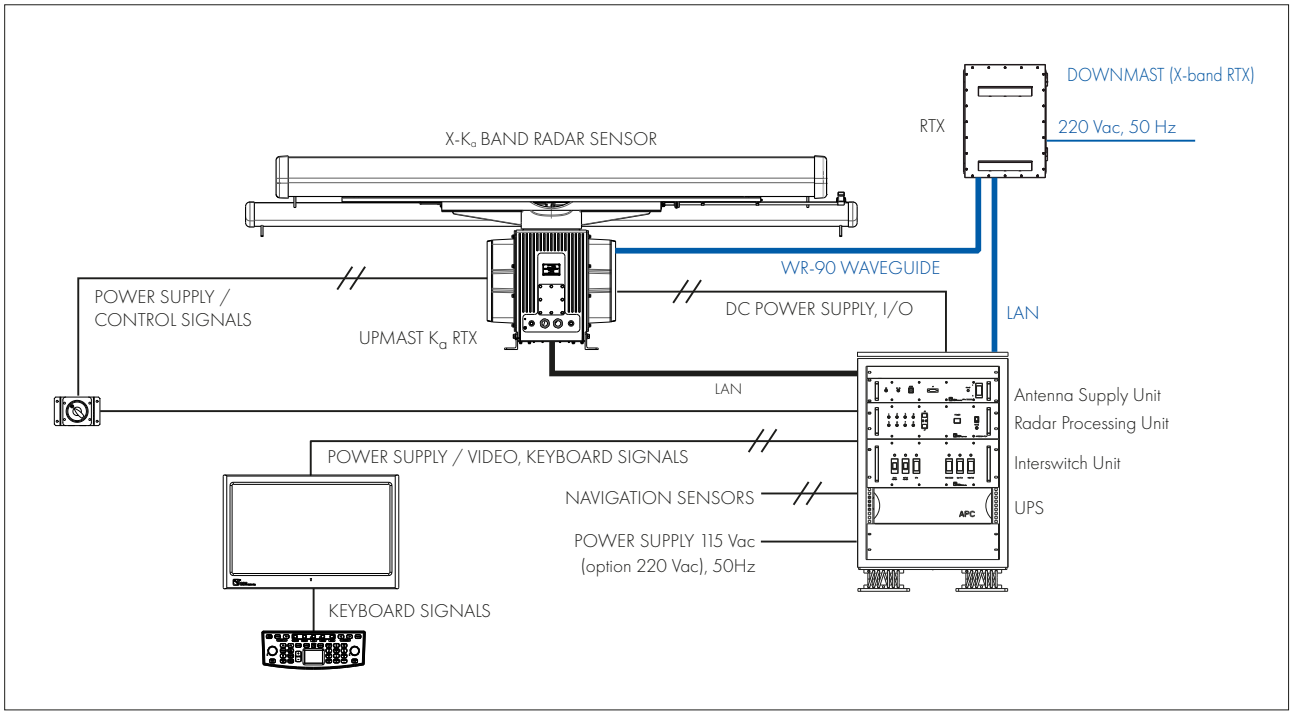


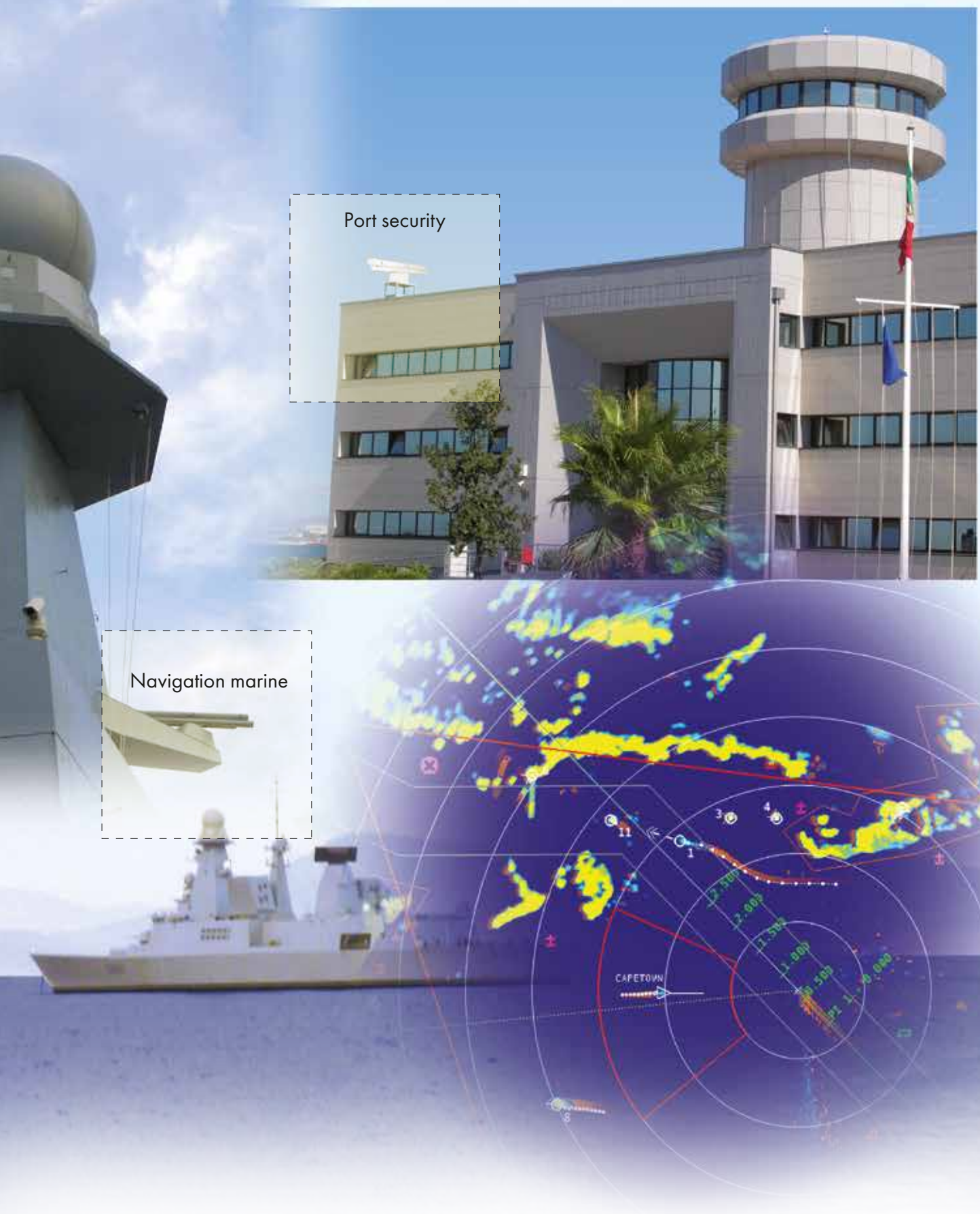
Weight: 1.8 kg

Power supply and processing rack



Weight: 120 kg





GEM elettronica

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