X-BAND FULL SOLID-STATE

SeaEagle

Maritime Navigation and Surveillance Coherent Radar

Main Features

• X-Band Solid State Transmitter
• Pulse compression and coherent processing
• Software – handled frequency management
• Pulsed doppler processing
• Frequency Diversity
• Low voltage operation
• Fully compatible with existing GEM antennas

Performances

- Rejection of interferences from other radar emissions through suitable filters;
- Enhanced Signal/Noise ratio through intensive use of Doppler filters and most sophisticated correlation techniques;
- Helicopter approach and decking operation mode;
- Greatly reduced maintenance and increased reliability with respect to a traditional magnetron radar system;
Antenna arrays:
- length: 6', 7.5', 9' - 12'
- type: slotted waveguide array
  - frequency: between 9300 and 9500 MHz
  - polarization: horizontal or circular
  - horizontal beamwidth at -3 dB: 1.2° (6'), 1.05° (7.5'), 0.85° (9'), 0.65° (12°) (tolerance: ± 0.1°)
  - vertical beamwidth at -3 dB: 25° (6', 7.5' and 9'), 22° (12°) (tolerance: ± 10%)
  - side lobes within 10°: < -27 dB (6' and 7.5'), < -26 dB (9' and 12')
  - side lobes outside 10°: < -30 dB
  - gain: 29dBi (6'), 30dBi (7.5'), 31dBi (9'), 33dBi (12') (tolerance: ± 0.5 dB)

Antenna turning unit:
- rotation speed: at least or more than 22 rpm (IMO mode), 11 r.p.m. (SEARCH mode)
- tolerable relative wind speed: 100 knots (operative) – 120 knots (non operative)
- azimuth position: incremental encoder, 4096 pulses per revolution

Transmitter unit:
- fully solid state transceiver (no magnetron) with 50, 100, 200, 400 or 800 W peak power
- up-mast transceivers integrated in the antenna unit (up to 200 W) or down-mast transceivers for easy maintenance operations
- 27 selectable frequencies from 9300 to 9500 MHz
- PRF from 350 to 2500 Hz
- PW can be set down to 0.04, up to 93 µs; several types of pulses are combined in the same pulse repetition interval
- TX mode with linear/non-linear frequency modulation
- VSWR: not exceeding 1.4:1, continuously monitored with warning message and automatic emission reduction in case of anomalous value
- direct digital wave shape generation

Receiver unit:
- low noise, fully solid state linear coherent radar receiver with high sensitivity for weak radar signals, to give better performances
- FFT-based Doppler filter for SNR and SCR improvement
- adoption of the most advanced pulse compression techniques for pulse compression and coherent processing;
- noise figure: 5.5 dB, typical
- Intermediate Frequency: 75 MHz
- receiver bandwidth: up to 40 MHz
- pulse compression rates up to 930:1 depending on mode
- manual or automatic (A-STC) gain control
- dynamic range: ≥ 124 dB (including compression gain)
- MDS equivalent after pulse compression: ≤ -123 dBm (measured at 3dB level over the noise level)
- intra-pulse correlation algorithms (i.e. diversity mode) in order to reduce sea clutter and cancel undesirable multi-path propagation effects
- side lobe suppression: down to -55 dB (depending on mode of operation)
- minimum range: 32 m
- maximum range discrimination: 30 m in standard mode (15 m in enhanced mode)

Interfaces and other features:
- standard digital LAN interface for unlimited data output
- ease of integration within a radar network
- small size and weight, for installation on any roof or mast
- beacon and SART detection
- up to 10 blanking sectors, user selectable
Automatic STC
Non-Isotropic Clutter
Distribution due to strong wind in coastal area

It automatically generates a clutter suppression curve from the raw radar video. This dynamic curve adapts very rapidly to any sea clutter variation due to different environmental conditions. Automatic STC guarantees a remarkable advance compared to the traditional isotropic STC curve and it is very recommended when operating in higher sea states and in open waters.

CFAR
Three small fishing boats masked by dense rain clutter

CFAR is a range adaptive filter based on statistical measures to suppress unwanted echoes (like snow, rain and sea clutter) against small targets. It generates a dynamic threshold from two observation windows around the radar cell under test. Target censoring techniques are used to minimize target losses.

Scan to Scan Correlation
Small RIB approaching in Sea State Level 4 at about 1,5 NM

It exploits target correlation proprieties to enhance sub-clutter visibility. This improved scan to scan correlation technique is used for a superior discrimination of fluctuating medium speed targets on high sea clutter condition. The filter compares the current radar cell under test with the history of activity in that range cell to stabilize and enhance real targets against randomic echoes such as sea clutter. A memory up to 64 consecutive scans is kept by the filter. Filter loss could be observable only for very fast targets.
Display type:
- colour flat screen LED LCD monitor up to 27” (320 mm PPI size) and relevant keyboard
- very wide selection of radar controls (e.g. range scale, PRF, PW, interference rejection), video controls (STC, FTC, gain) and tools (EBL, VRM...)
- screen resolution up to 1920 x 1080 pixels with 256 video levels

Processing and presentation:
- ease of usage through a user-friendly interface with keyboard and graphic presentation based on pop-up/pull-down menus allowing to open/close windows for data and functions management through a trackball-controlled cursor
- all installation parameters (such as alignment data, operation commands pre-set) can be stored in memory using the keyboard
- range scales: from 0.0625 to 96 n.m. (130 n.m. with off-center)
- two VRM, two EBL and an electronic marker with off-centre capability
- image freeze: stops the current image for a more accurate control
- echo stretch, allowing the enhancement of small radar returns
- plot function of all echoes preceding positions with automatic decay, user programmable
- PPI off-centre: off-centre representation of radar image in all directions
- signal processing functions: FTC, STC, interference rejection, CFAR, pulse-to-pulse correlation, scan-to-scan correlation, echo stretcher
- additional software module available for management of GEM elettronica proprietary Ship Identification System

ARPA functionality:
- manual or automatic acquisition and automatic tracking of up to 450 targets
- guard zones, in order to generate automatic alarms once a target enter or exit such zones
- tracking inhibition areas, In order to disable target initialisation and tracking
- clutter maps, to adaptively modify plot extraction thresholds in presence of areas with different sea and noise levels

System interfaces:
- all the on-board navigation sensors, such as GPS, compass or gyrocompass, LOG, plotter, etc.
- other devices, such as AIS, TLC, etc.
- direction finder, with on-screen display of the EM source bearing
- high-speed Ethernet connection for data sharing

System management and maintainence:
- ease of fault detection, due to comprehensive BITE system covering the whole system: Tx power levels, VSWR, receiver sensitivity
- very high reliability and reduced maintenance
- ease of access for maintenance, due to easy access to all replaceable parts
- very low power consumption, mostly due to the use of LED LCD display
- reduced size and weight, for easy installation in small spaces
- rugged construction in order to be used in harsh environment and in unmanned sites
- advanced, latest generation product compliant with the relevant international standards
### Outdoor equipment

**Down-mast**
- Weight: 70 Kg
- Dimensions: 255 x 500 x 370 mm

**Up-mast**
- Weight: 10 Kg
- Dimensions: 570.5 x 600 x 135 mm

**Radar Distribution Unit**
- Weight: 13 Kg
- Dimensions: 566 x 580 mm

**Scanner Unit**
- Weight: 170 Kg
- Dimensions: 440 x 180 mm

**Radar Processing Unit**
- Weight: 10 Kg
- Dimensions: 420 x 180 mm

**Down-mast transceiver**
- Weight: 70 Kg
- Dimensions: 710 x 685 mm

**Antenna System Weight**: 50 Kg (w/o array)

**Scanner Unit Weight**: 170 Kg (w/o array)

### Performance Monitor
- Dimensions: 825 x 490 mm

### Table for Array Lengths and Weights

<table>
<thead>
<tr>
<th>Model</th>
<th>Array Size</th>
<th>Length</th>
<th>Weight</th>
</tr>
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<tbody>
<tr>
<td>AU11-06NE</td>
<td>6 feet</td>
<td>1980 mm</td>
<td>6 Kg</td>
</tr>
<tr>
<td>AU11-07NE</td>
<td>7.5 feet</td>
<td>2315 mm</td>
<td>14 Kg</td>
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<tr>
<td>AU11-09NE</td>
<td>9 feet</td>
<td>2790 mm</td>
<td>22 Kg</td>
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<tr>
<td>AU11-12</td>
<td>12 feet</td>
<td>3830 mm</td>
<td>24 Kg</td>
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</tbody>
</table>
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This brochure should not be considered a contractual offer to sell. The specifications given herein may be changed by the manufacturer, GEM elettronica S.r.l., without notice.

marketing@gemrad.com  www.gemrad.com