

## PHOENICE SUBMARINE RADAR SYSTEM

### General

PHOENICE - a multi purpose radar system designed for submarines - is characterized by its high adaptability. It consists of a pressure tight sensor head (antenna, drive unit, transceivers).

Two different radar antennas are available: a micro strip hybrid CSC<sup>®</sup> antenna with air surveillance capability (MSA) and a slotted array antenna (P-RAX).

Part of the sensor head is a combination of a FMCW- and/or pulse-transceiver which allows on one hand tactical (air) surveillance and on the other hand safe navigation in IMO compliance. For the connection from the sensor head to the inboard units a sole cable link is sufficient, no long, lossy waveguide connection is required.

The Low Probability of Intercept (LPI) feature, based on frequency modulated continuous wave (FMCW) technology, allows the principle of "Seeing, without being seen" based on extreme low power emission. In combination with additional tactical features detection by ESM systems is practically impossible. An additional pulse transceiver covers all IMO requirements for safe navigation.

Both transceivers are controlled by the PHOENICE server. The radar operator can toggle between the two transmitters instantly. The selection depends on the mission profile. The received video signal including the azimuth information of the antenna is pre-processed in the server and then digitized and provided to the radar clients on different consoles in the radar network.

This architecture ensures that at the same time multiple radar operators get access to the respective radar video for the analysis of their "Area of Interest". The PHOENICE server forwards the pre-processed video to a plot extractor, which calculates the plots for the selected range in real time. Supplementary to the digital video all plots are distributed to the PHOENICE multi purpose consoles. Each operator can acquire tracks in his "Area of Interest".

### Technical characteristics

#### FMCW Transceiver (LPI feature)

- selectable transmitting power 1 mW to 1 W
- excellent resolution in range & bearing
- Solid-State-Design, high MTBF

#### Pulse Transceiver

- 4 kW X-band transmitter
- Pulse repetition frequency free programmable 400 – 8000 Hz
- Pulse width free programmable 50 – 1000 ns
- Low Noise receiver
- Sea Clutter rejection

#### PHOENICE Server

- Control of different radar transceivers
- Plot extraction and plot export via Ethernet
- Export of digitized video to Ethernet
- Multi console & multi user operation
- Radar image recording (option)

#### PHOENICE Client (Software)

- IMO compliant navigation for the own ship
- IMO target tracking (TT) for remote controlled vehicles
- Tactical add-ons , such as „Sector-Scan“
- „Single Scan“ with video freeze
- Display of periscope/ optronic mast bearings
- Support of Pan & Zoom function, "Area of Interest"
- Requires standard computer hardware
- Easy integration in C2 systems

#### PHOENICE Multi purpose-console

- Proven design in German Navy (AIS/ECDIS consoles)
- Available for standing or sitting operator

#### PHOENICE Radar antennas, pressure tight

- 1.) refer to MSA Microstrip Hybrid with CSC<sup>®</sup> air surveillance
- 2.) refer to P-RAX Slotted Array

#### PHOENICE Antenna motor, pressure tight

- Refer to Thales PRIMOSS 250 L or S

#### PHOENICE Bridge display, pressure tight

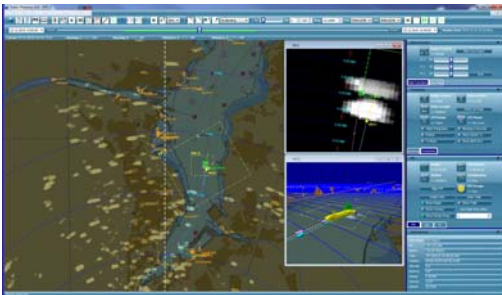
- Refer to Thales PBD 17 & AVS

## Functional aspects

PHOENICE operates in I-Band (formerly X-Band) providing best performance for target detection. The up mast installation of the transceivers avoids lossy, long waveguides. The sensor head allows easy installation of PHOENICE to radar masts of different mast manufacturers.

A sole cable connection between sensor head and inboard electronics enables the selection of non-penetrating low cost mast systems.

A waveguide switch, controlled by the PHOENICE server, connects the selected transceiver to the antenna. PHOENICE SW Client requires standard hardware and can therefore be installed on Thales multi purpose consoles or on other MFCCs easily. The SW client connects itself via Ethernet to the PHOENICE server and participates on data exchange.



## Technical facts

Frequency band	I-Band
FMCW output power	1 mW to 1 W (operator selectable)
Pulse output power	4 kW for up mast unit 20 kW for inboard unit
Range scales	24 Nm for FMCW sensor, 96 Nm for pulse sensor
Antenna gain	26 dB
Main beam	< 2°
Antenna width	1175 mm
Weight of antenna motor	< 200 kg
Weight of antennas	< 35 kg
Number of supported consoles	8 clients simultaneously
Standards for non THALES MFCCs	Operating system: MS Windows or Linux, Standard keyboard, Mouse with three buttons, Speaker

## Power supply & consumption

115 V, 60 Hz, 1 phase, approx. 800 VA.

## Environmental conditions

Ambient temperatures:

Outboard: -25 °C to +55 °C, Inboard: -5 °C to +55 °C

Shock: 30 g half sine, 11 ms, any direction

EMC: MIL 461 Rev. E

Airborne noise: < 49 db [A]

## Variants & Options

Instead of the up mast transceiver location

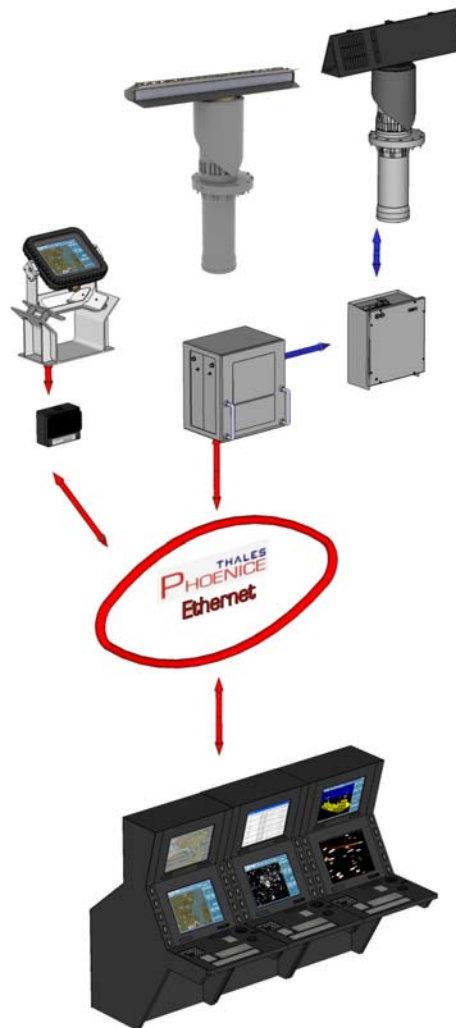
- a wall mounted 20 kW variant and
- a down mast 20 kW variant

of pulse transceivers are available for inboard installation.

For these transceivers the short version of the antenna motor PRIMOSS 250S with waveguide connection is applicable.

A Pressure tight Bridge Display PBD17 for fix installation on the bridge of the submarine displays RGB video sources, such as radar, ECDIS and gyro.

In combination with the Auxiliary Video Switch PBD17 up to four different video sources reach access to the bridge display. The operator can toggle between the sources and operate the displayed software with a handy remote control or the Thales Pressure tight TrackBall PTB.



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