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RADius

A New Contribution to Demanding Close Up DP Operations

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THE FULL PICTURE

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Close Up DP Operations

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- Short reaction times if something fails
- Possible large consequences results from incidents
- Contains special challenges to reference systems

Security Issues

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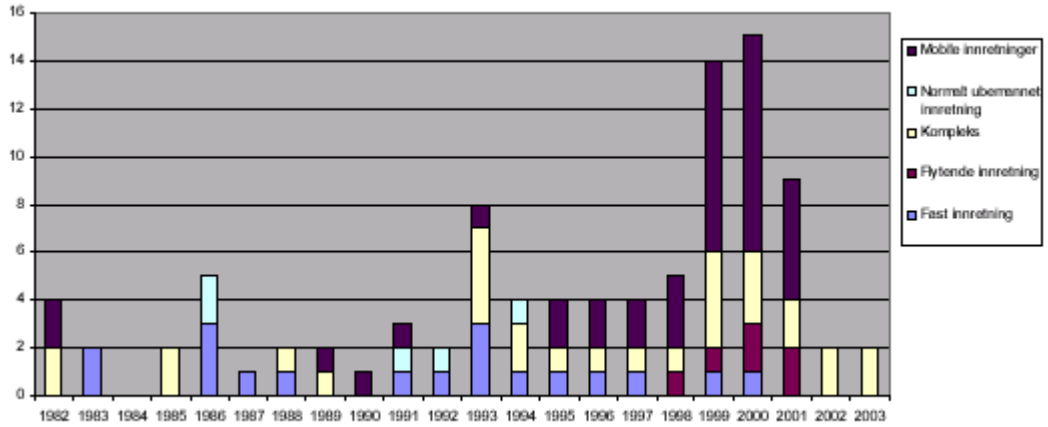
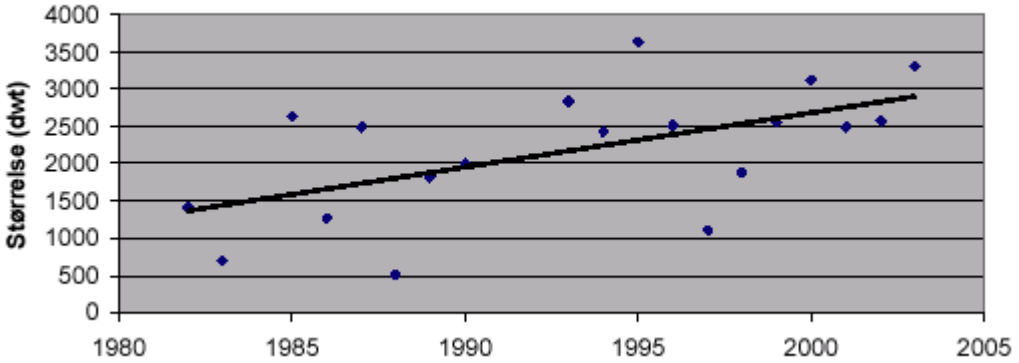
- The number of collisions world wide is of great concern both to oil companies and ship-owners.
- The Norwegian petroleum safety authority is concerned about the increasing size of vessels involved in collisions.





Security Issues

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- Customer demand
  - Several contractors demands DP class 2 requirements for DP operations within safety zones.
- Legislation issues (IMO)
  - *.2 For equipment classes 2 and 3, **at least three** position reference systems should be installed and simultaneously available to the DP-control system during operation.*
  - *.3 When two or more position reference systems are required, they should **not all be of the same type**, but based on different principles and suitable for the operating conditions.*

RADius - Relative Positioning System

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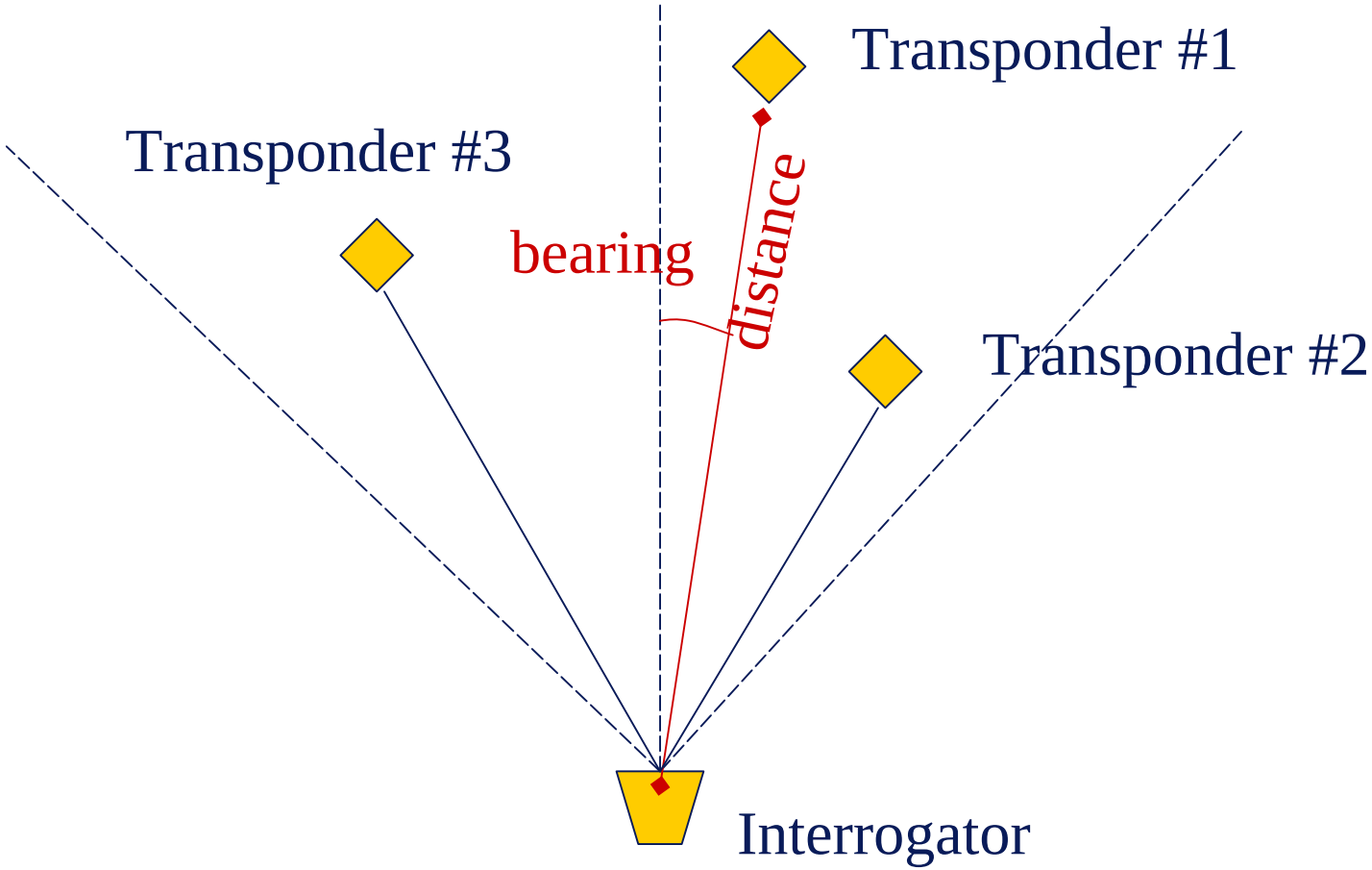

RADius Application

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RADius Application

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RADius Performance

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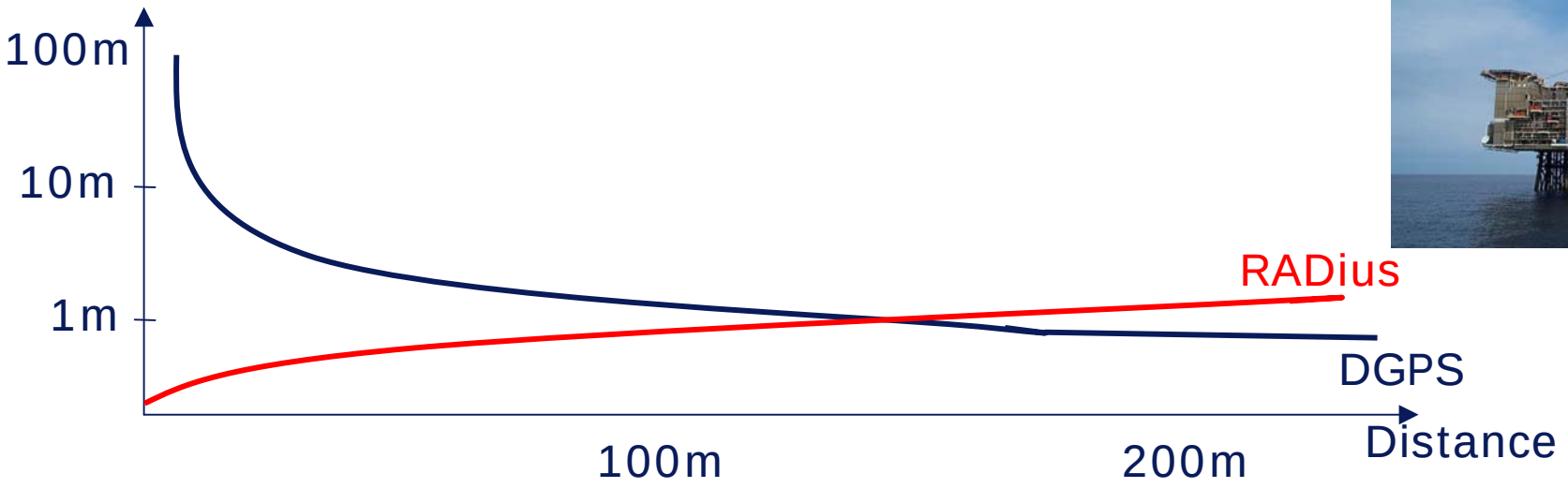
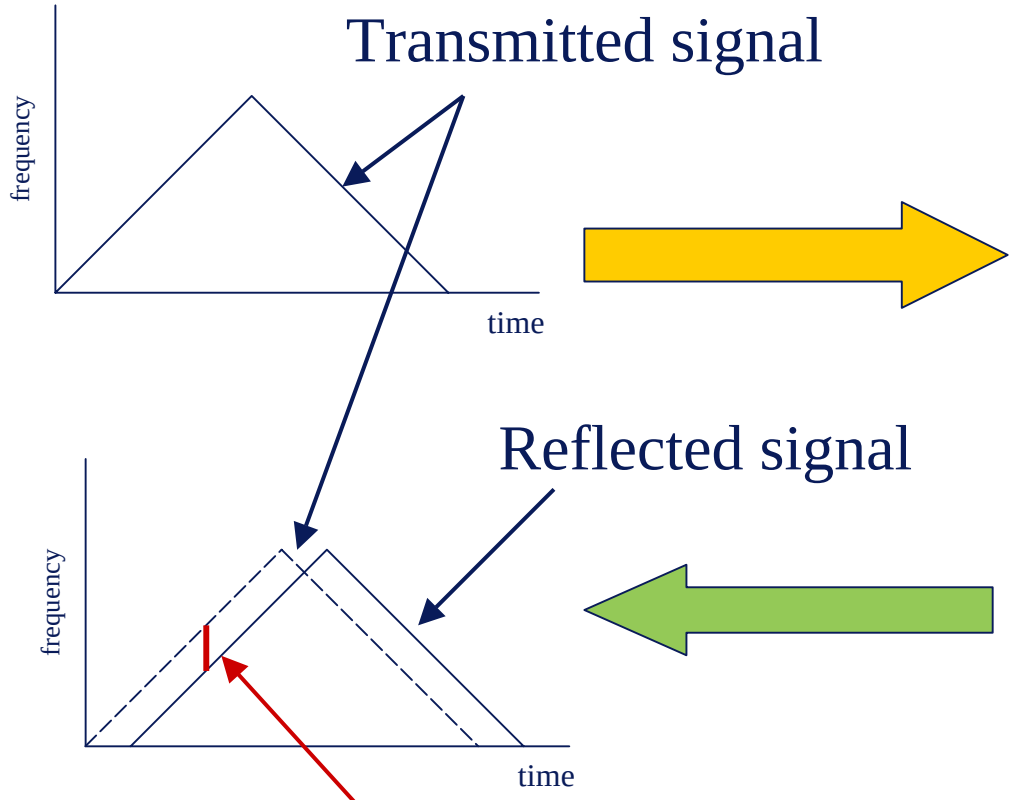


- **Robust and precise relative position reference** for DP operations when close to structures or other vessels
- **Complementary** to DGPS e.g. as DGPS tends to have reduced accuracy close to structure or other vessels, RADius increases accuracy
- **Increasing integrity** by tracking multiple transponders and built-in accuracy assessment and performance evaluation

RADius Principles for Range Determination



F_b – beat frequency

Distance = ½ • F_b/F_s • Ts • c

Velocity = ½ • D • L

RADius Principles for Attitude Determination

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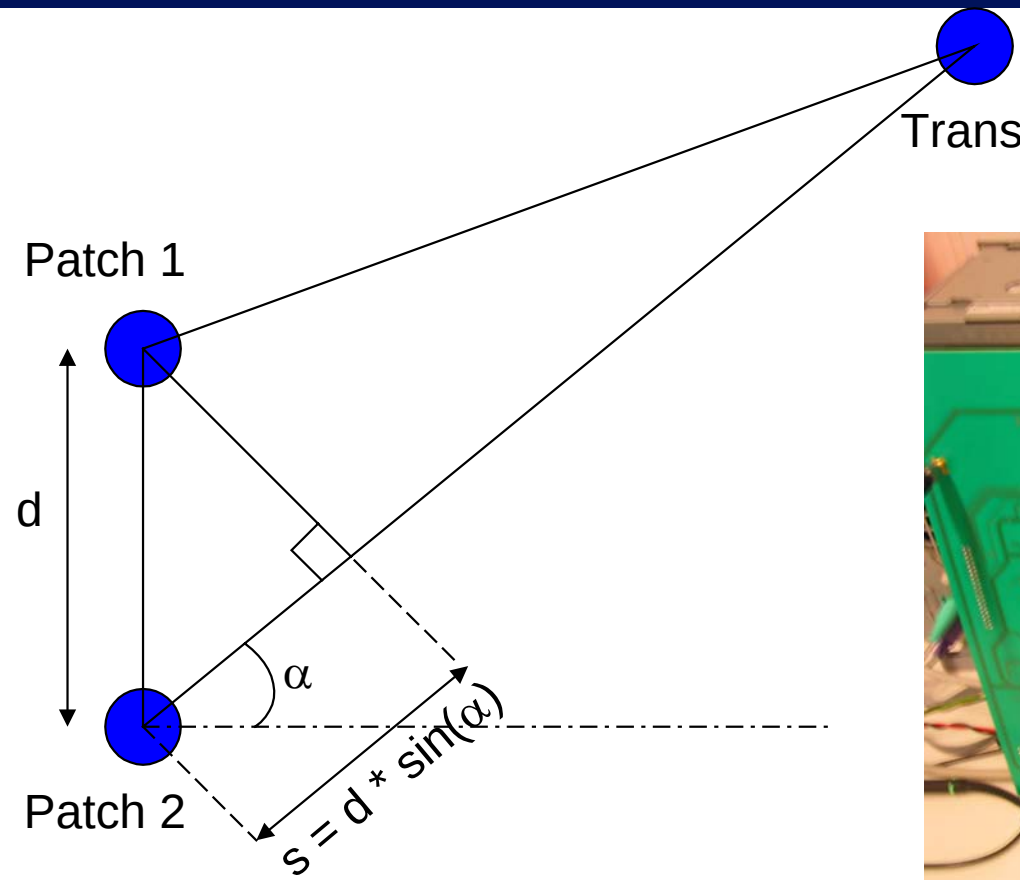
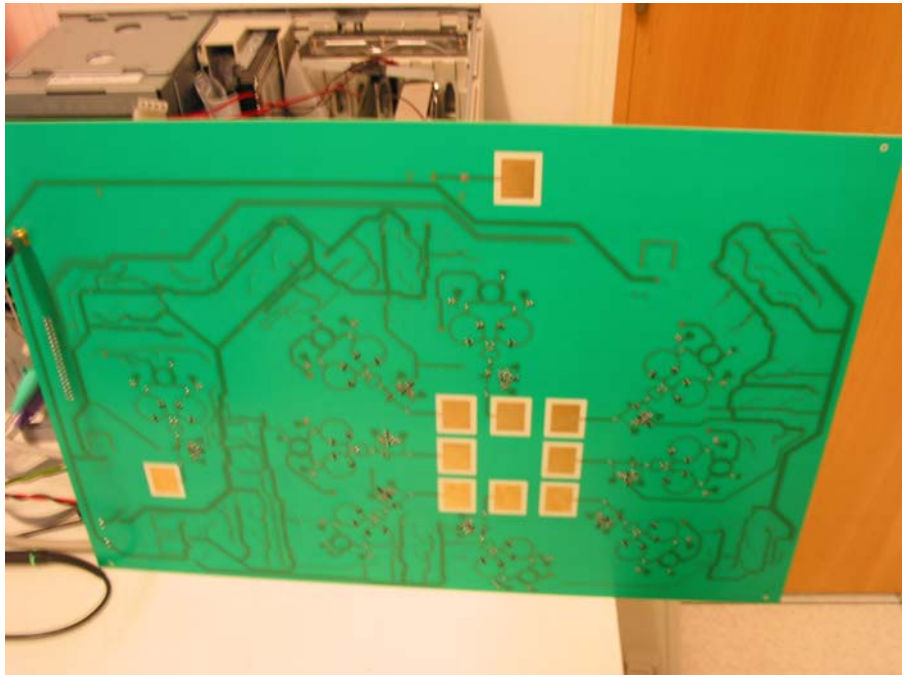
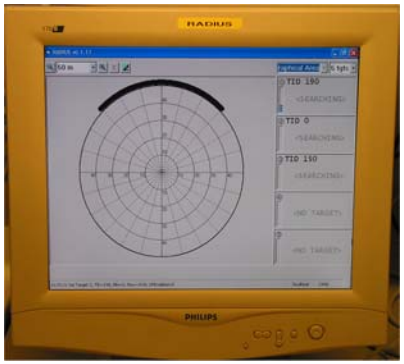




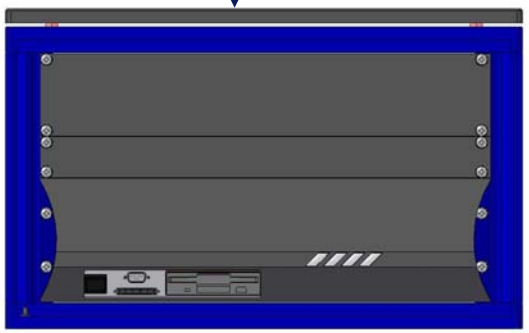
$$\phi_d = s \bullet \frac{2\pi}{\lambda}$$

, Phase difference, patch 1 and 2

RADius Product Modules



Radius 1000
Interrogator Unit (IU)



Radius 800
Controller Unit (CU)

Radius 600
Transponders

RADius Operational Advantages

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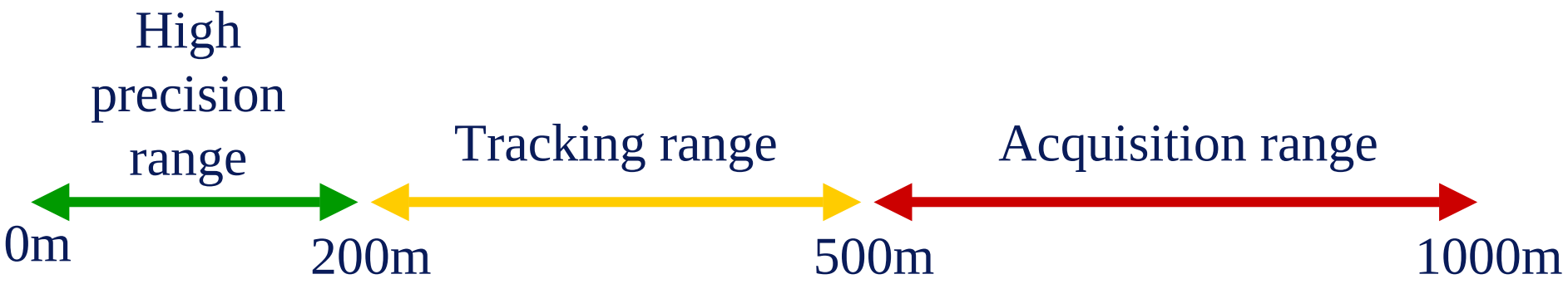
- No moving parts
  - Solid state
  - Low maintenance cost
- Operates in all weather conditions
- Complementary to existing GPS positioning reference system
- Multi user
- Multiple transponder capability
  - Redundant measurements
- License free radio frequency
- Integrity

RADius Operating Range



Accuracy
Azimuth < 0.5°
Distance < 0.5 m

Limited azimuth accuracy

Distance measurements

RADius (Patent Pending) Specifications

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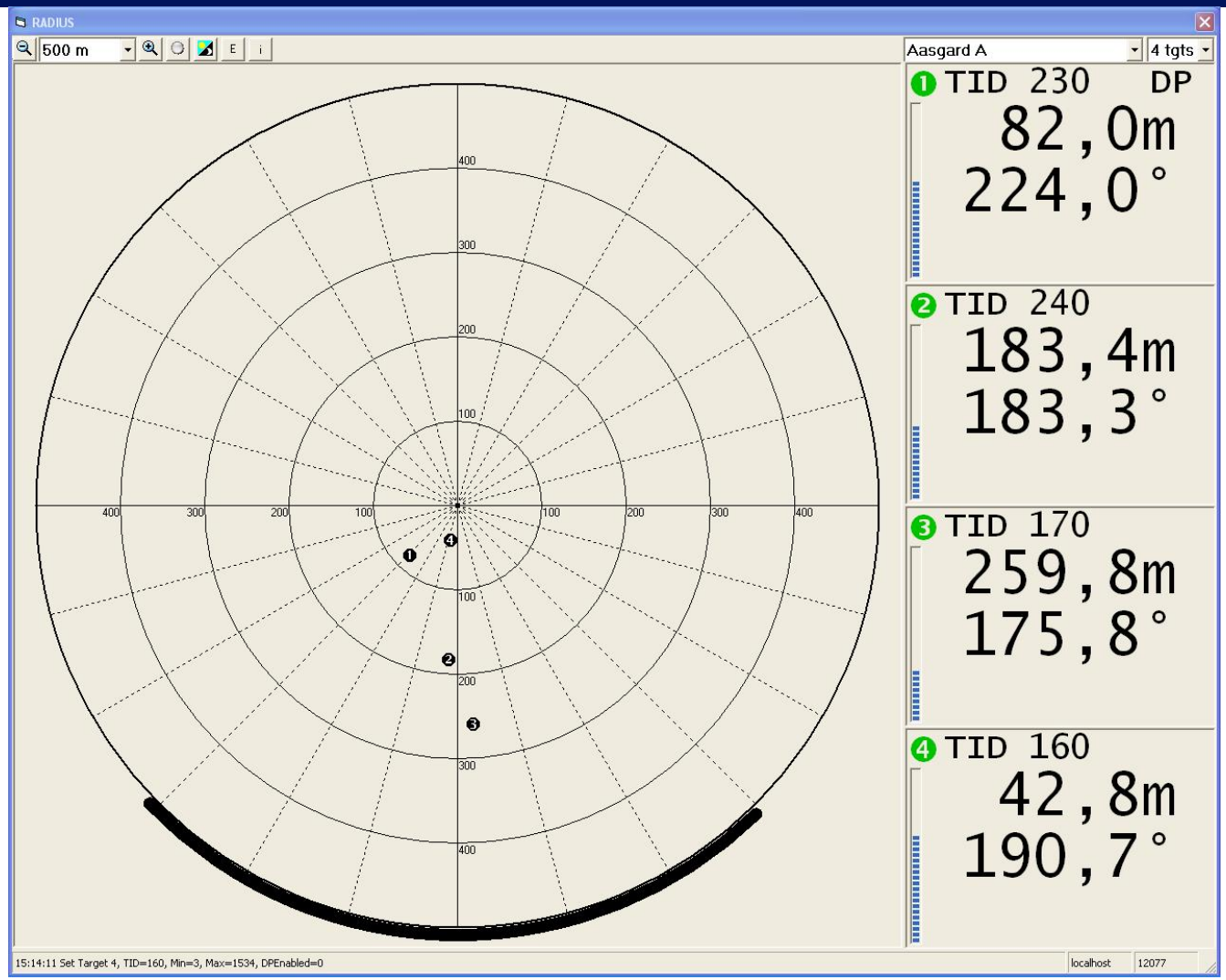
- Accuracy: 0.5 m, 0.5 º (High precision range)
- Update Rate up to 5 Hz.
- Temperature range -25 - +55 °C (-13 - 131 °F)
- Frequency band 5,51 – 5,61 Ghz
  - Sweep 100 Mhz
- Tx Power < 1 W
- Dimension/ Weight:
  - Interrogator 562x412x184 mm / 7 Kg
  - Transponder 220x228x72 mm / 1.4 Kg

Graphical User Interface



GUI Vessel Illustration

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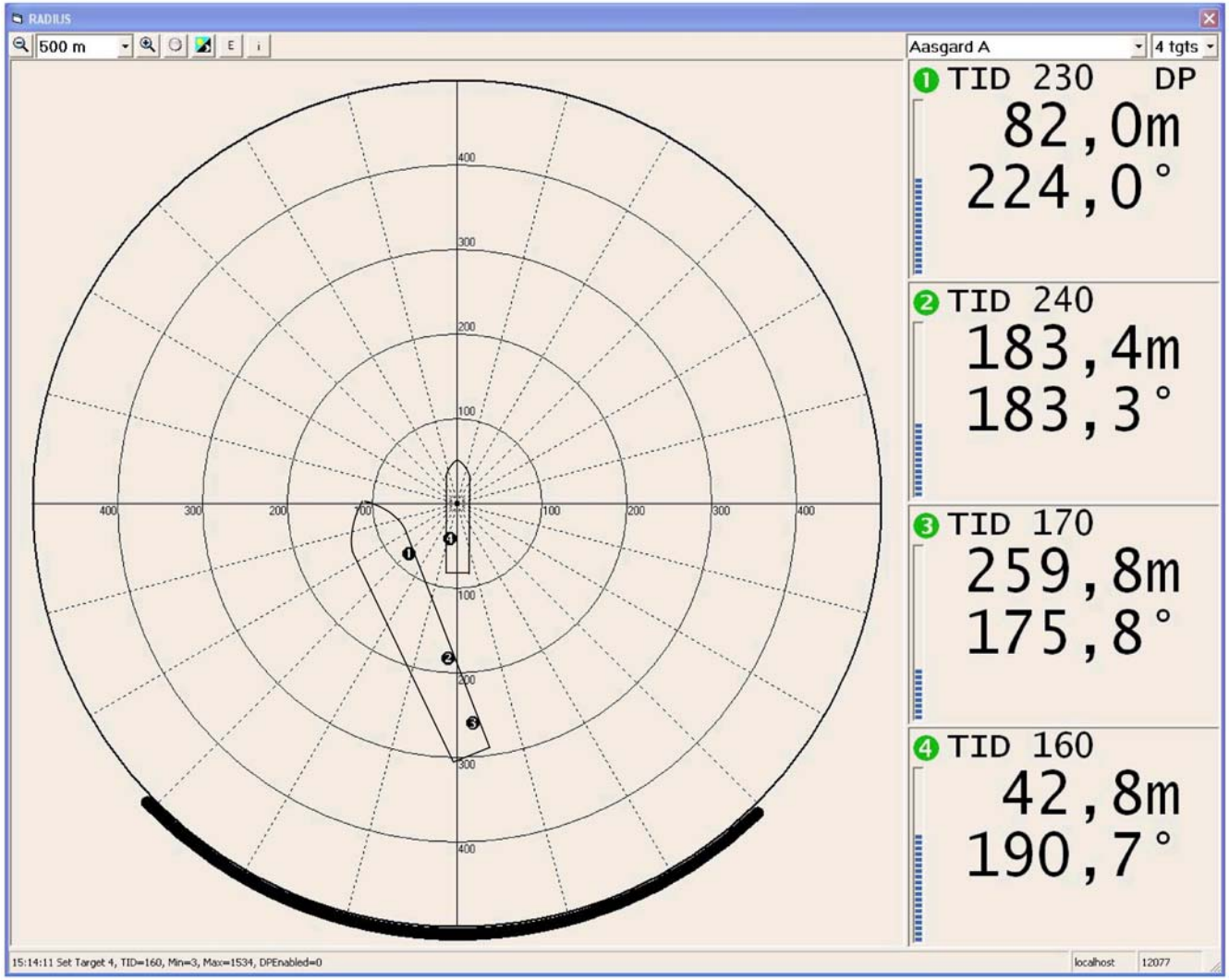
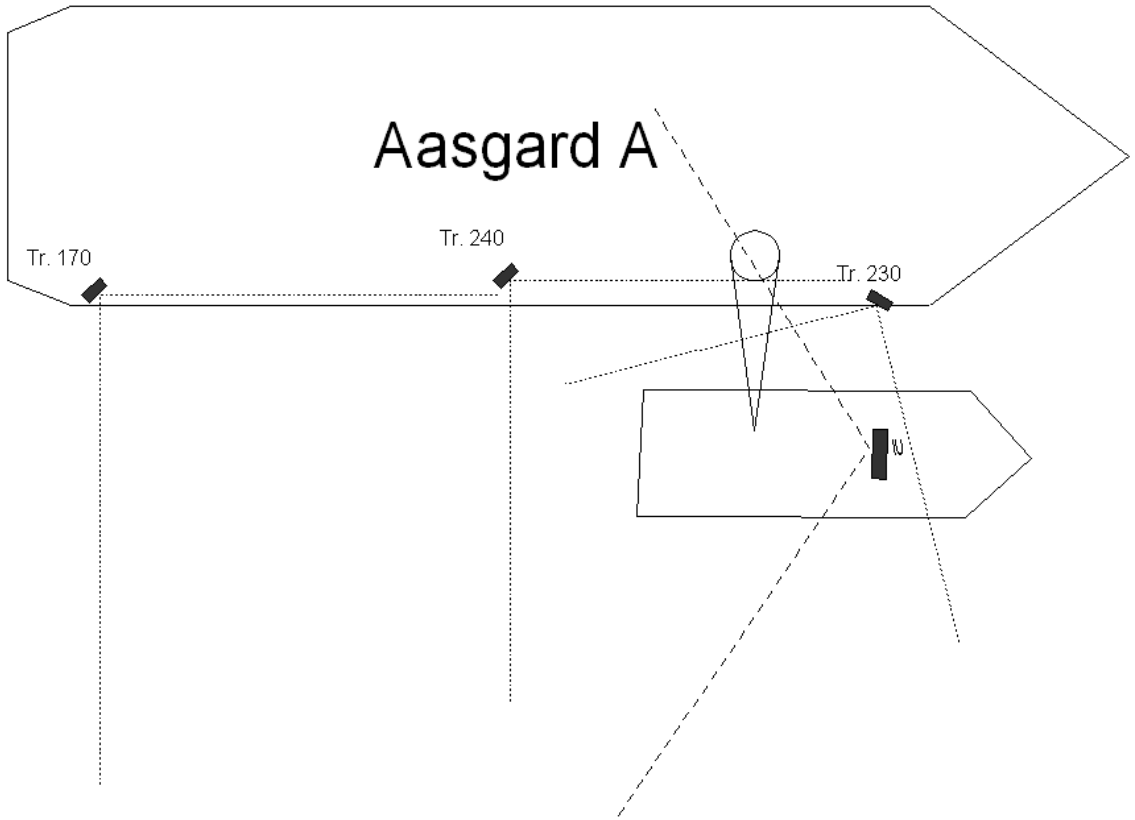


Operating Scenario



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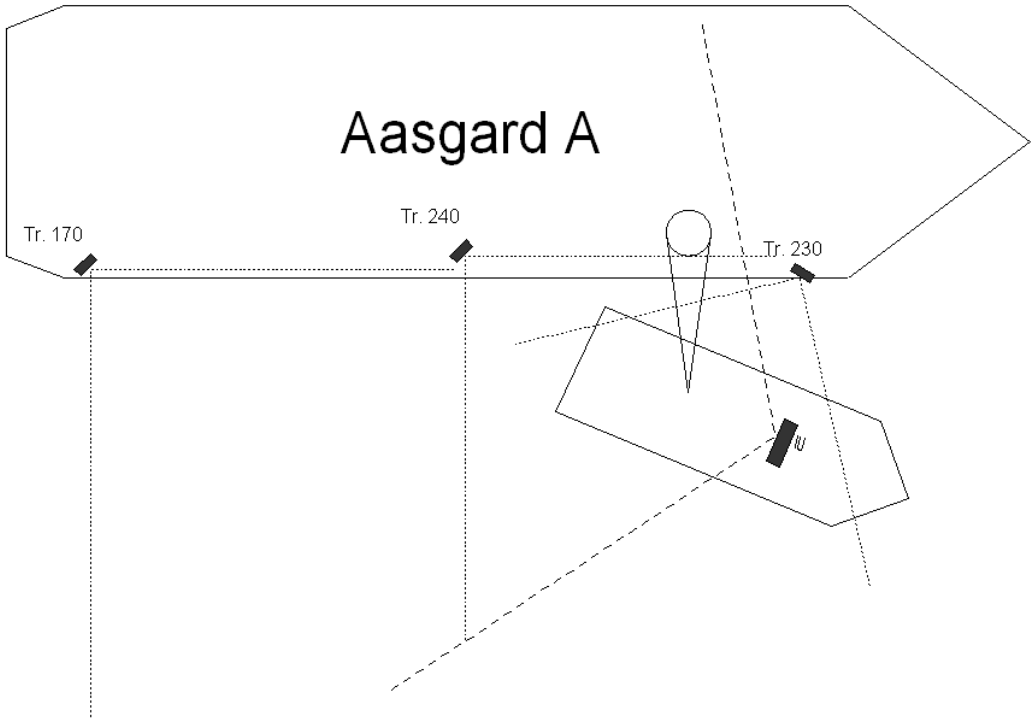

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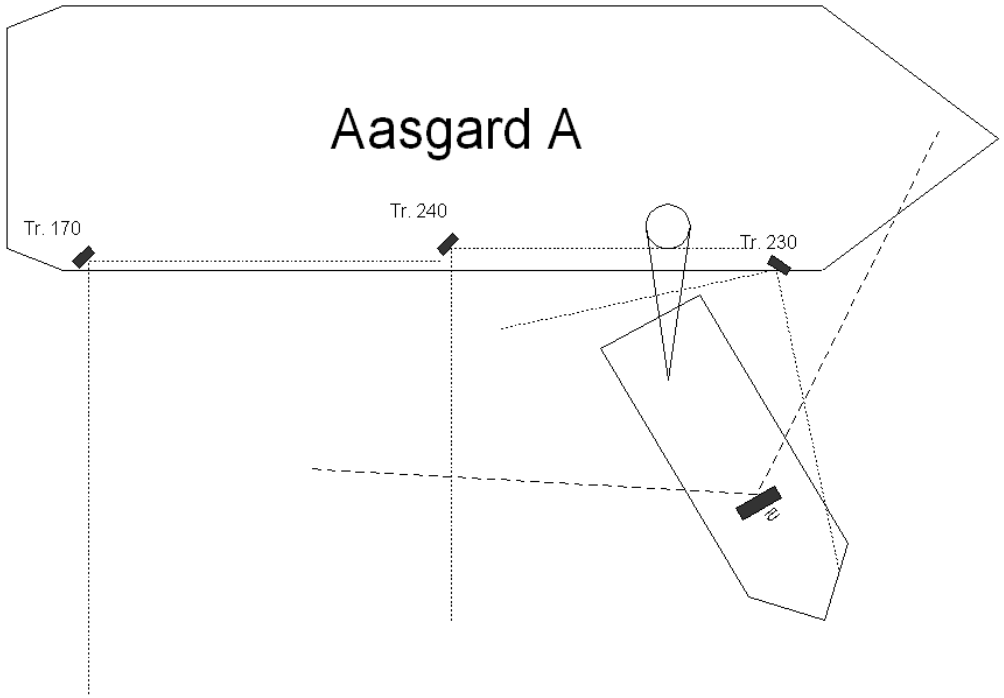

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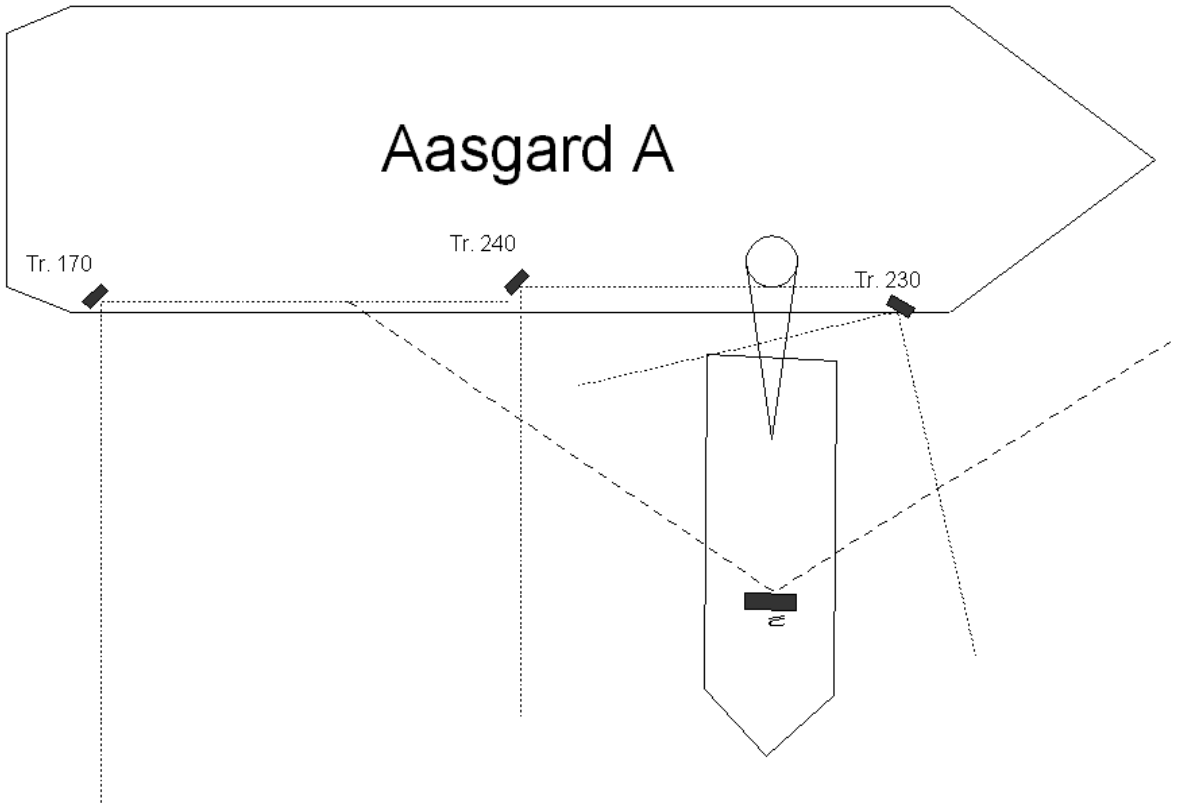

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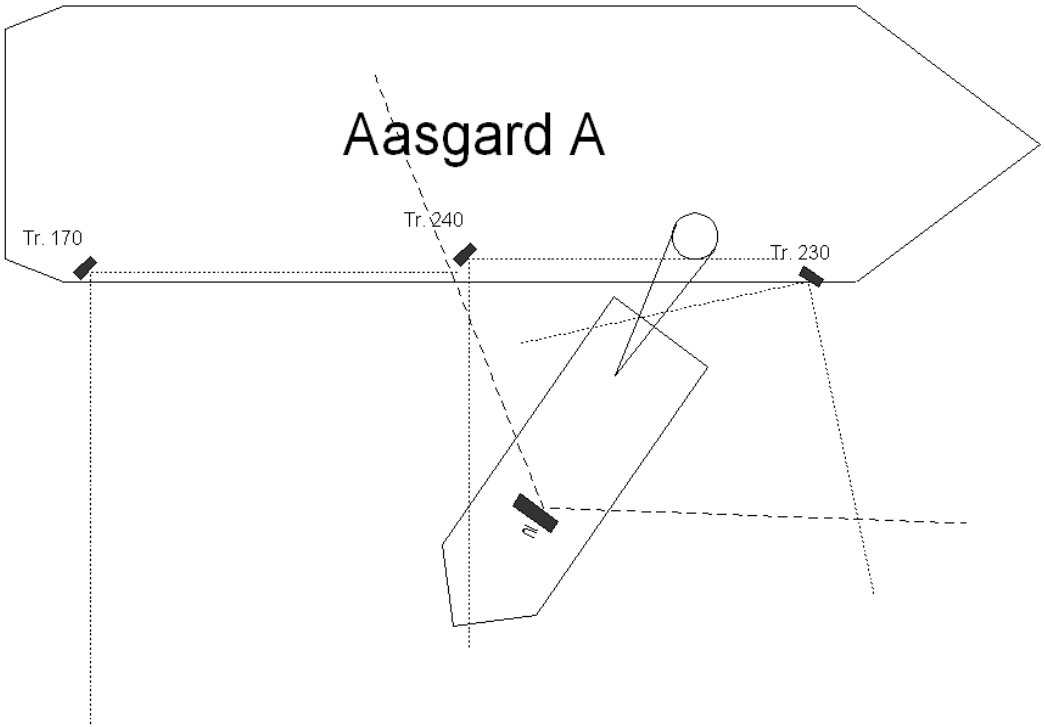

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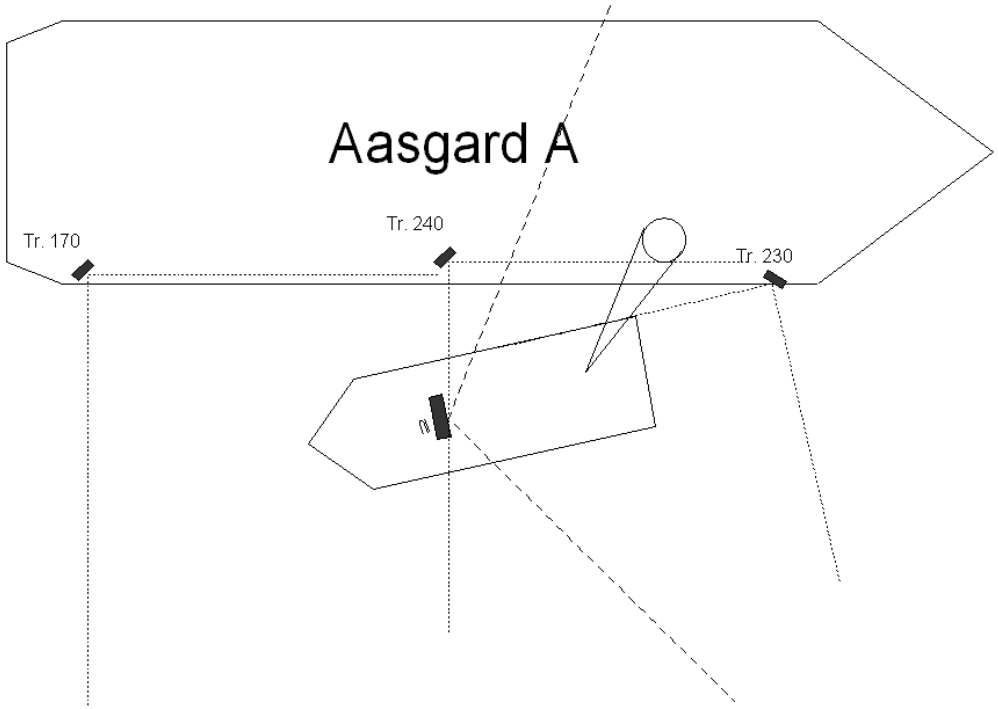

RADius Modular Extension

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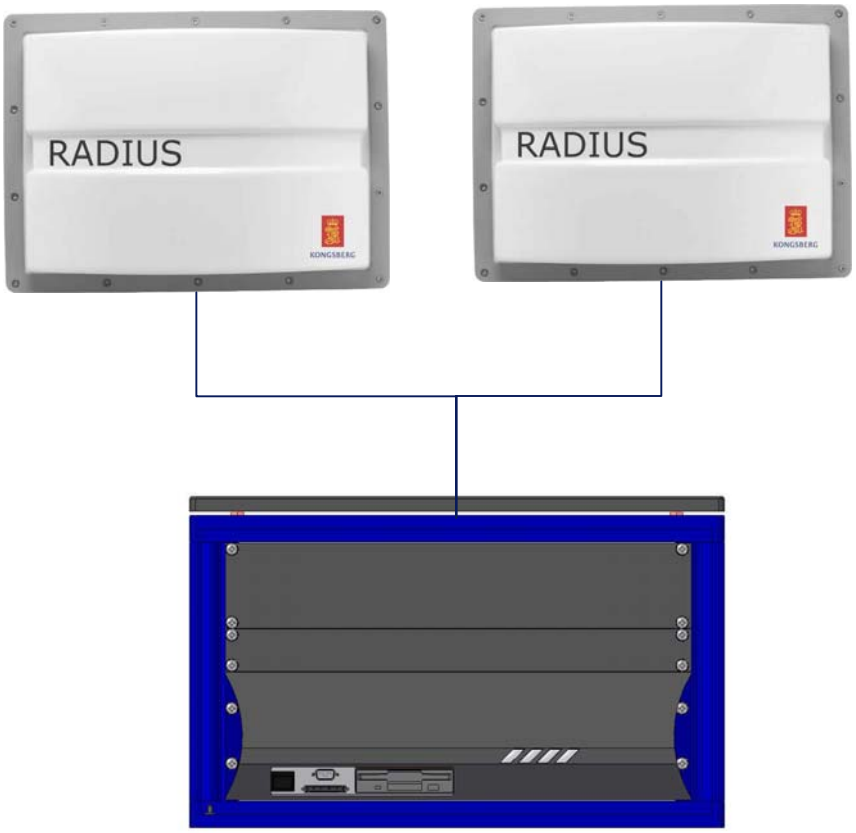
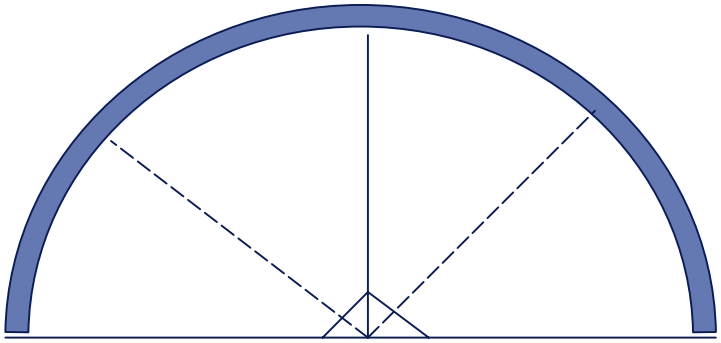
Multiple interrogators





Extended sector

Relative DP Operations, Relative Positioning Systems

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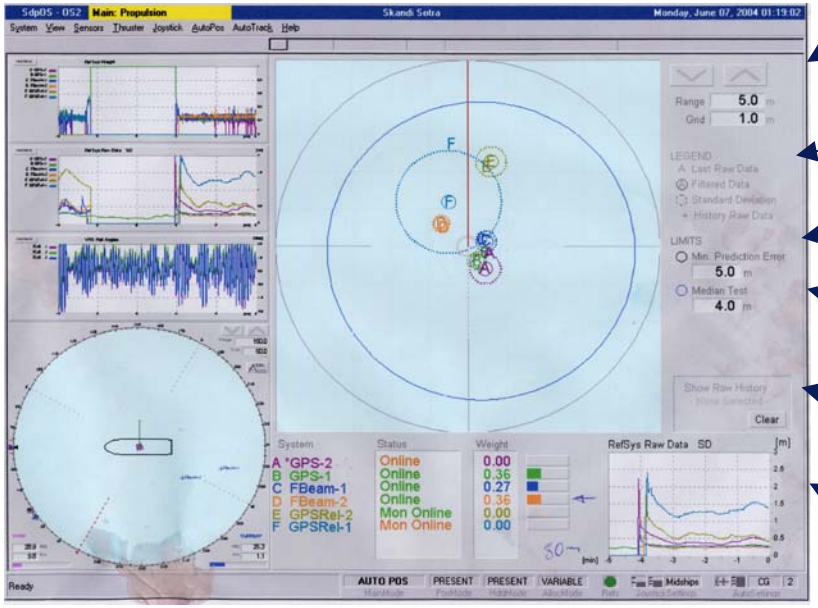
DP, Skandi Sotra



RADius
Relative

DARPS
Relative &
Absolute

DARPS
Relative &
Absolute

Optical

Relative

Snap shot from DP, Skandi Sotra, Aasgard A

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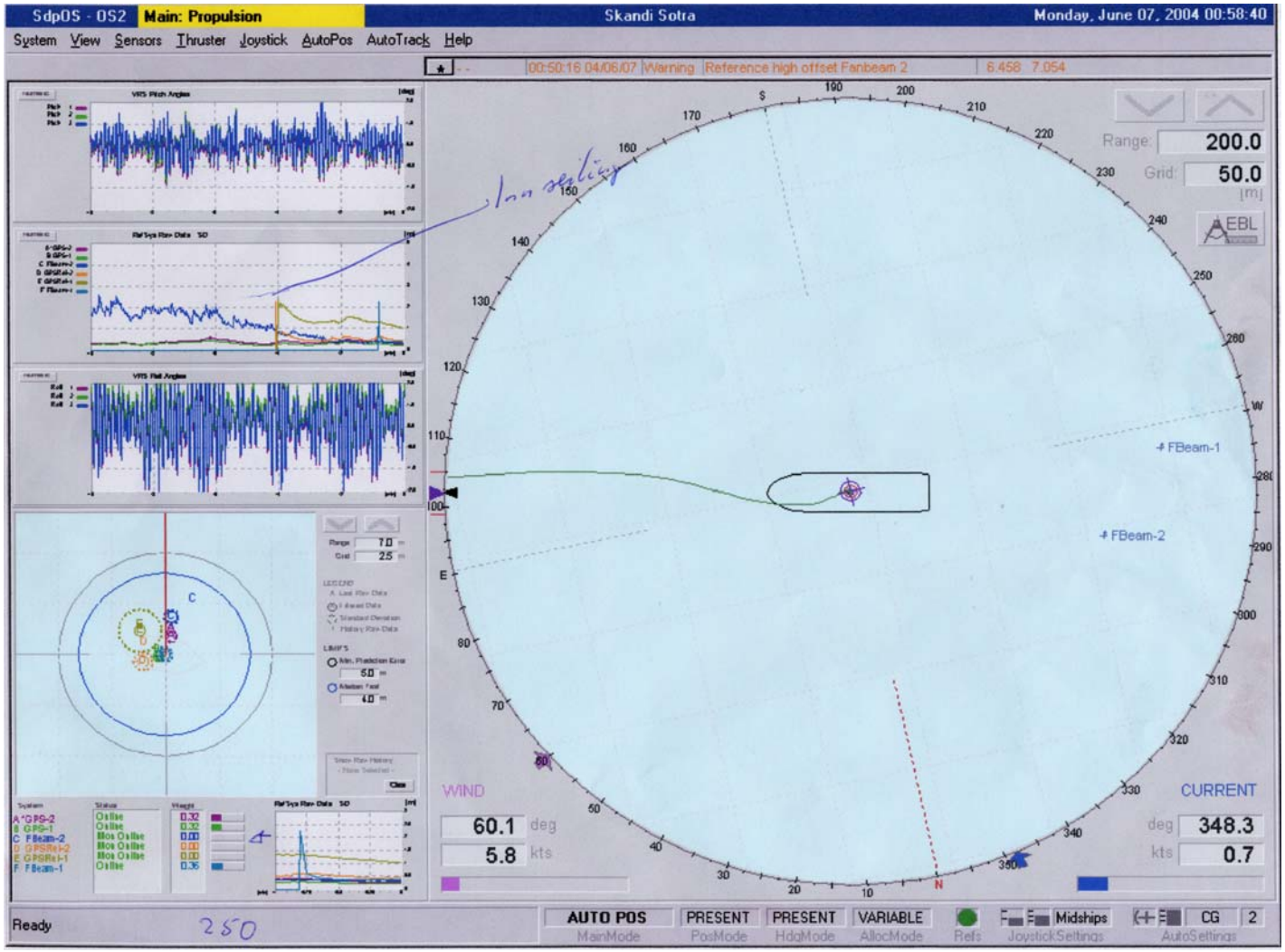

Conclusion

- Size and complexity of vessels operating in offshore waters are increasing due to focus on efficiency and cost-effective use of assets
- Operators are determined to take action to decrease number of accidents and costs
- RADius has proven its performance through offshore operations in the North Sea in rough conditions
- RADius is a new position reference system contributing to fulfill IMO requirements to reference systems based on different principles