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RADius

**A New Contribution to Demanding Close Up
DP Operations**

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Kongsberg Seatex

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Close Up DP Operations

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

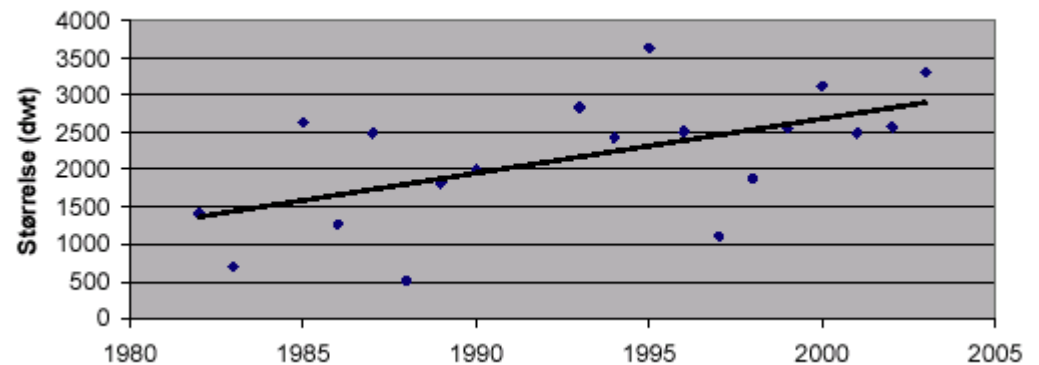
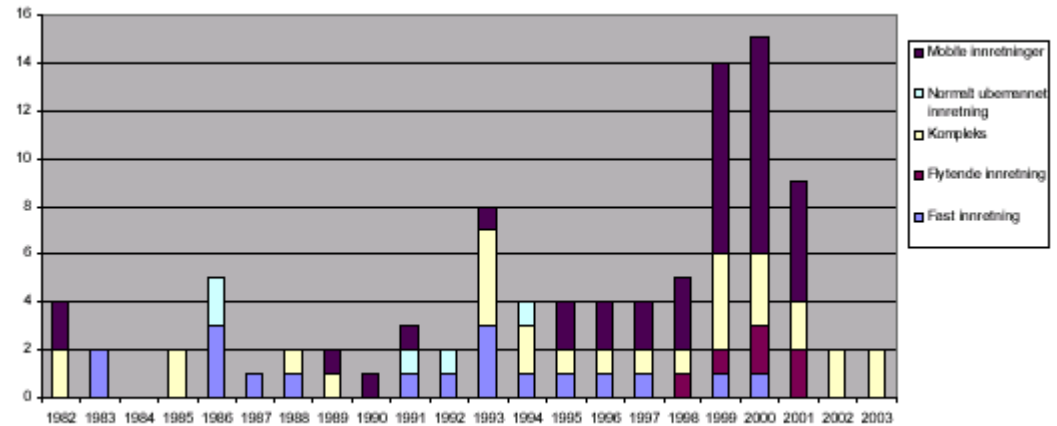


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Security Issues

- 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.



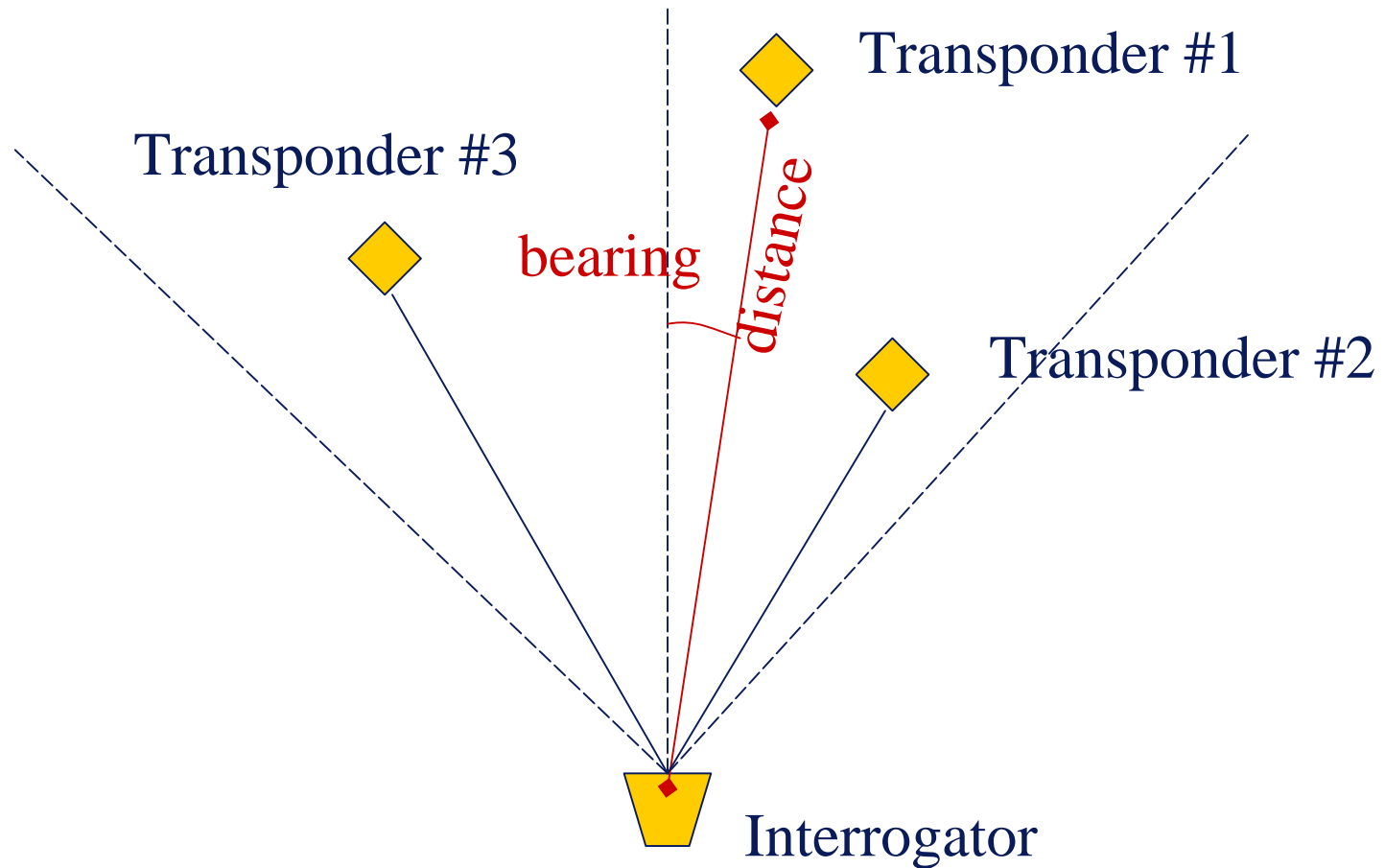


Security Issues

- 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



RADius Application



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RADius Application



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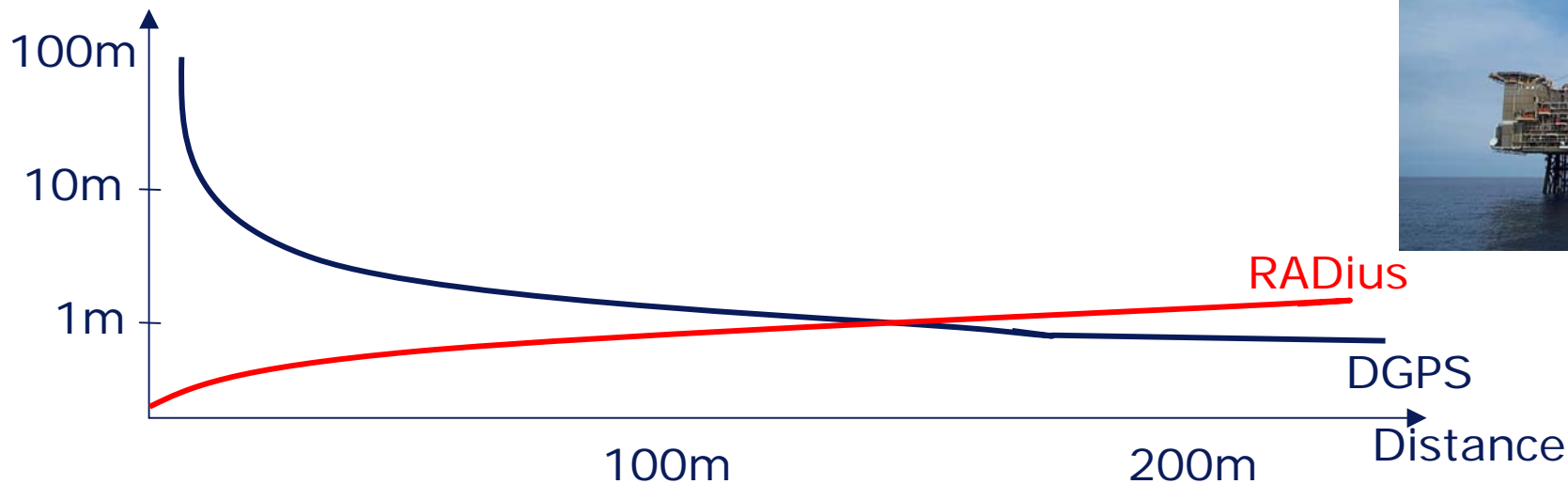


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RADius Performance

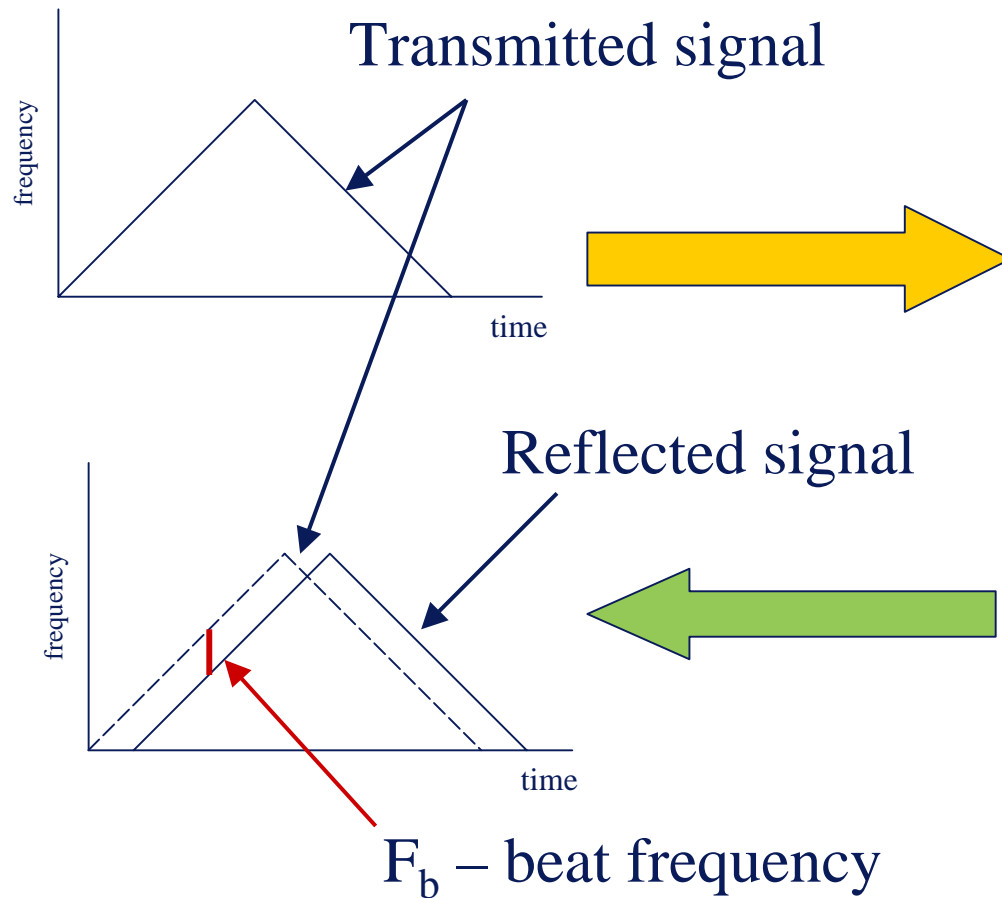


- **Robust and precise relative position reference** for DP operations when close to structures or other vessels
- **Complementary** to DGPS e.g. as DGPS tends to have reduced accuracy close to structure or other vessels, RADius increases accuracy
- **Increasing integrity** by tracking multiple transponders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

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RADius Principles for Range Determination

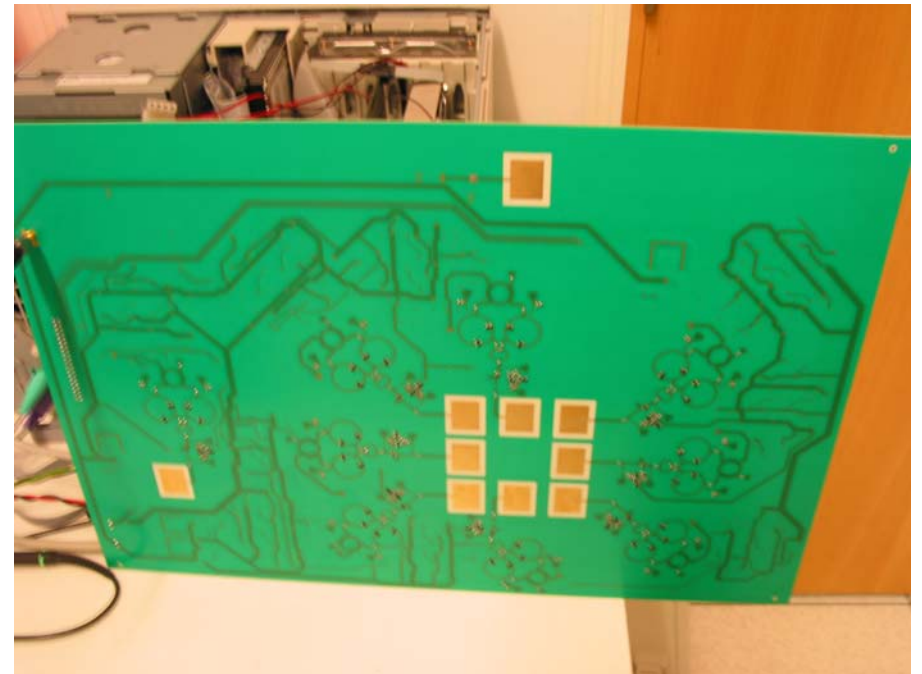
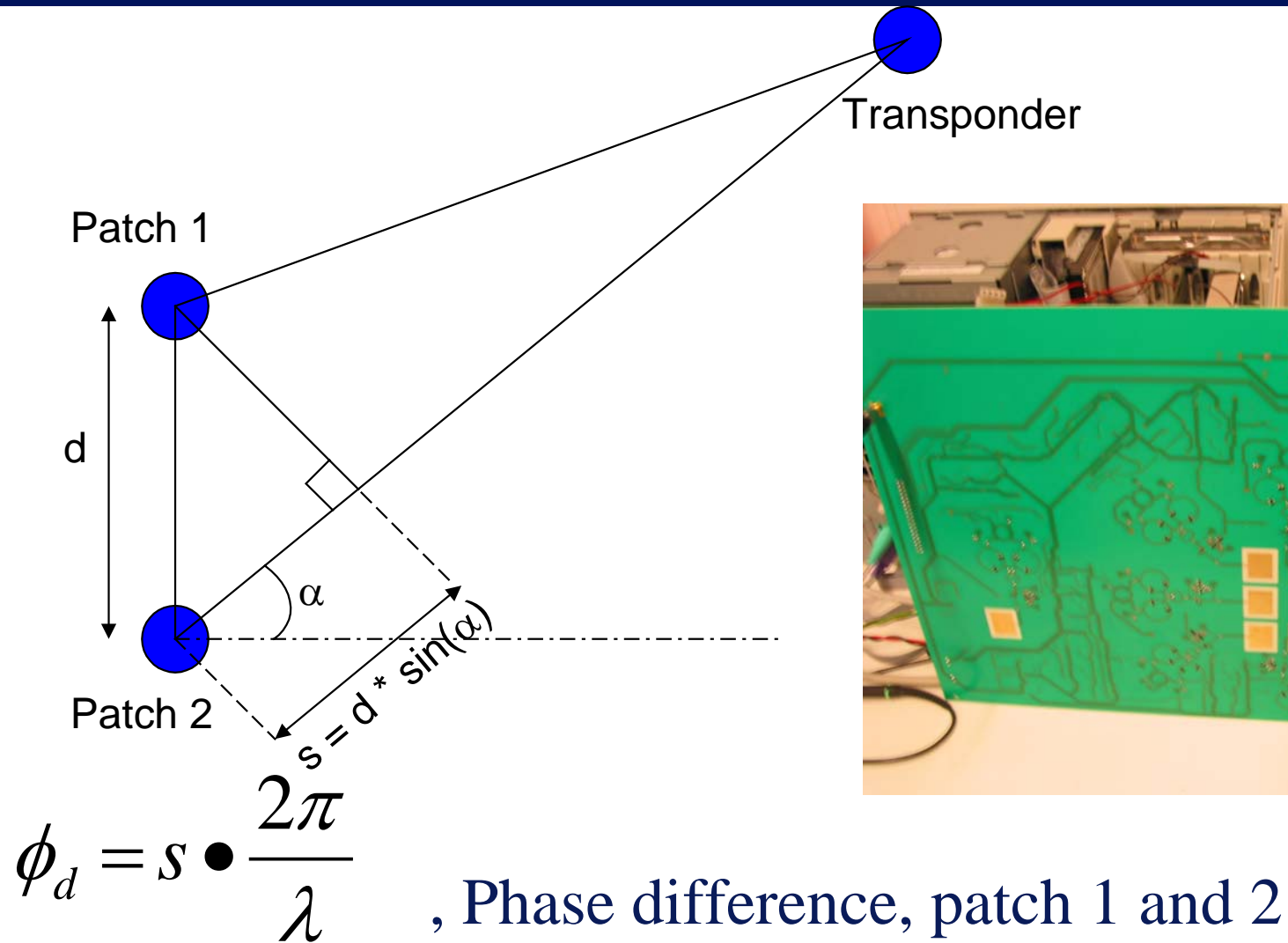


$$\text{Distance} = \frac{1}{2} \cdot F_b / F_s \cdot T_s \cdot c$$

$$\text{Velocity} = \frac{1}{2} \cdot D \cdot L$$



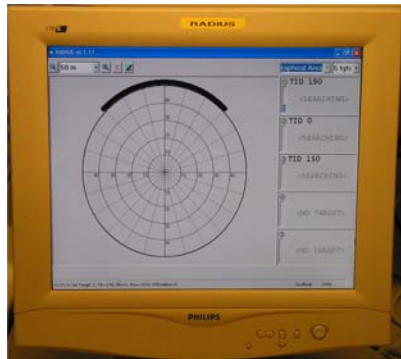
RADius Principles for Attitude Determination



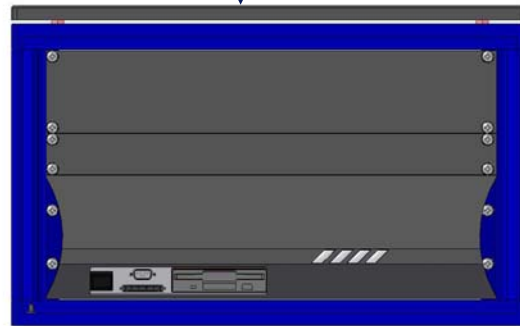


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RADius Product Modules



Radius 1000
Interrogator Unit (IU)



Radius 800
Controller Unit (CU)

Radius 600
Transponders



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RADius Operational Advantages

- 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

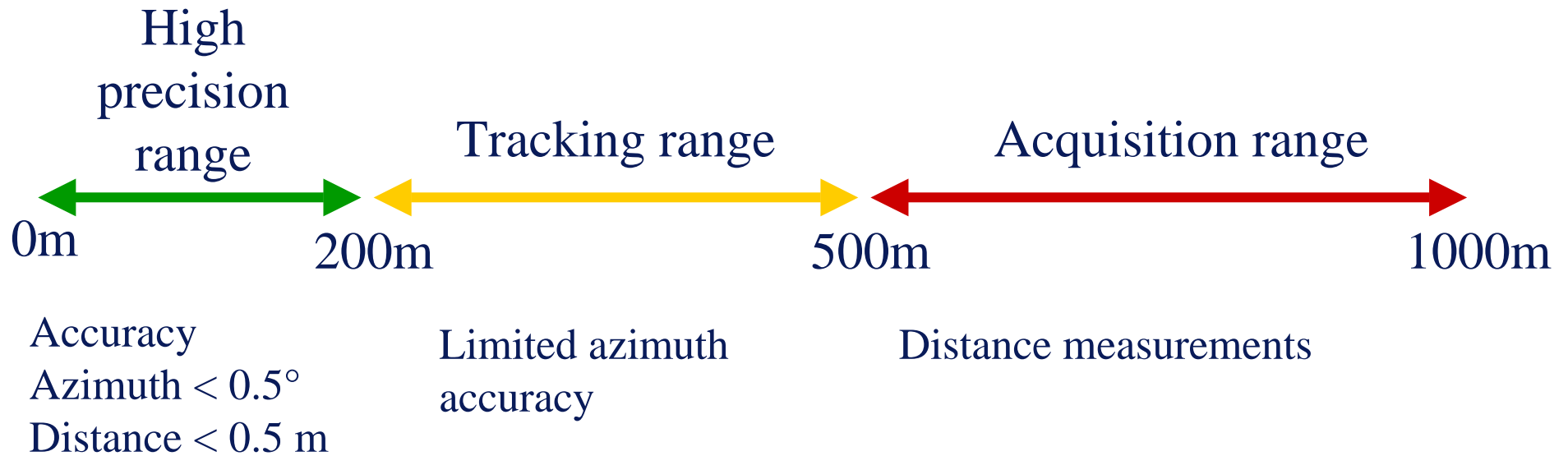


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RADius Operating Range



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RADius (Patent Pending) Specifications

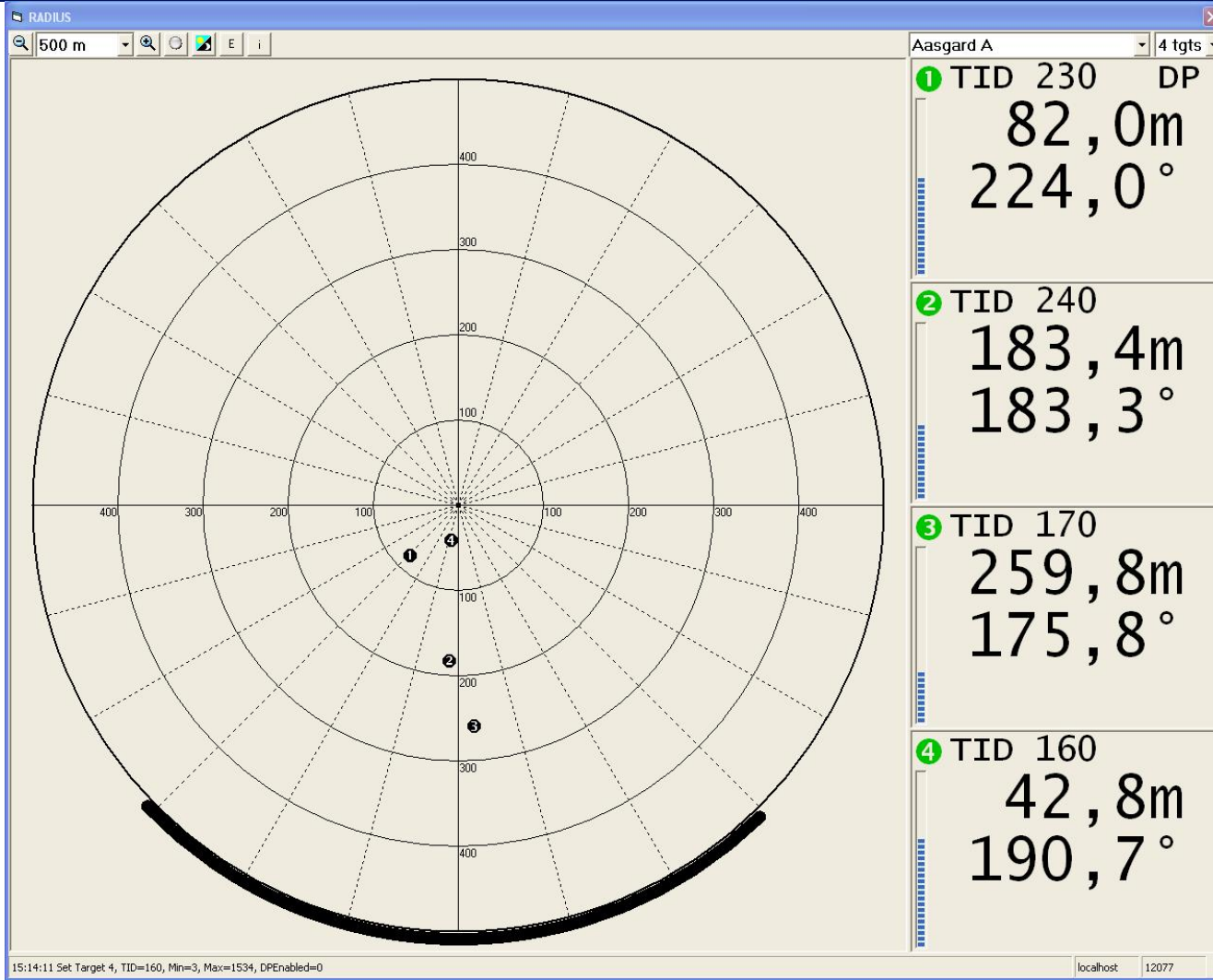
- Accuracy: 0.5 m, 0.5 ° (High precision range)
- Update Rate up to 5 Hz.
- Temperature range -25 - +55 °C (-13 - 131 °F)
- Frequency band 5,51 – 5,61 Ghz
 - Sweep 100 Mhz
- Tx Power < 1 W
- Dimension/ Weight:
 - Interrogator 562x412x184 mm / 7 Kg
 - Transponder 220x228x72 mm / 1.4 Kg

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Graphical User Interface



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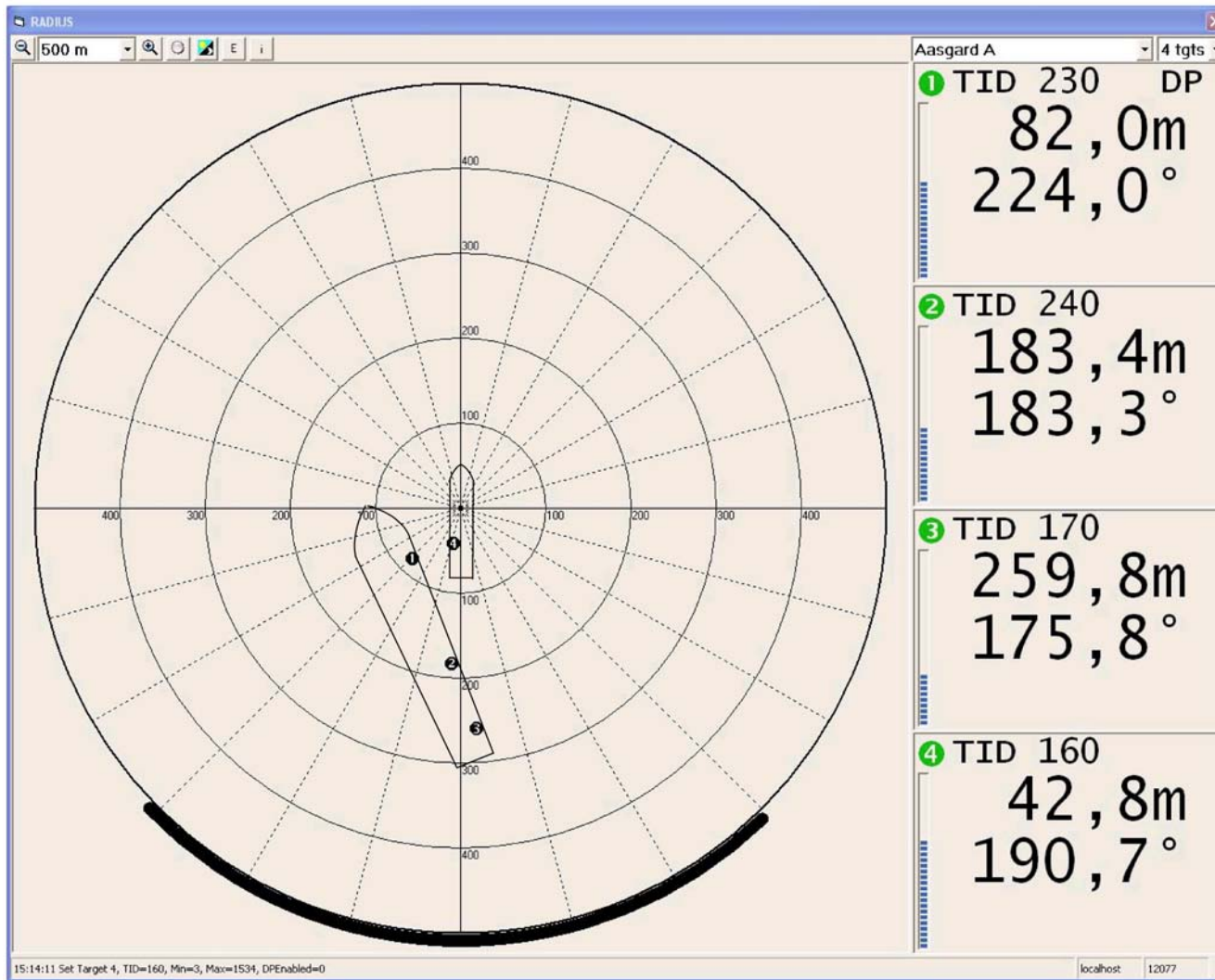


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GUI Vessel Illustration



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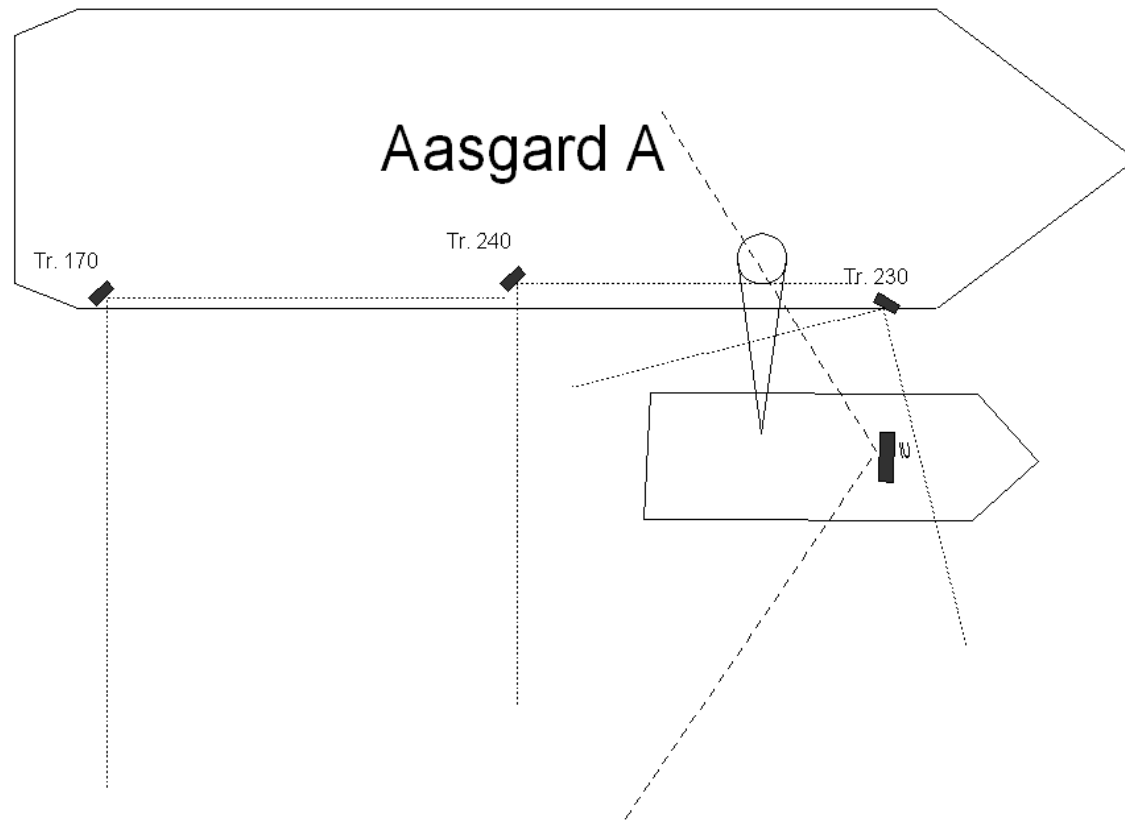


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Operating Scenario



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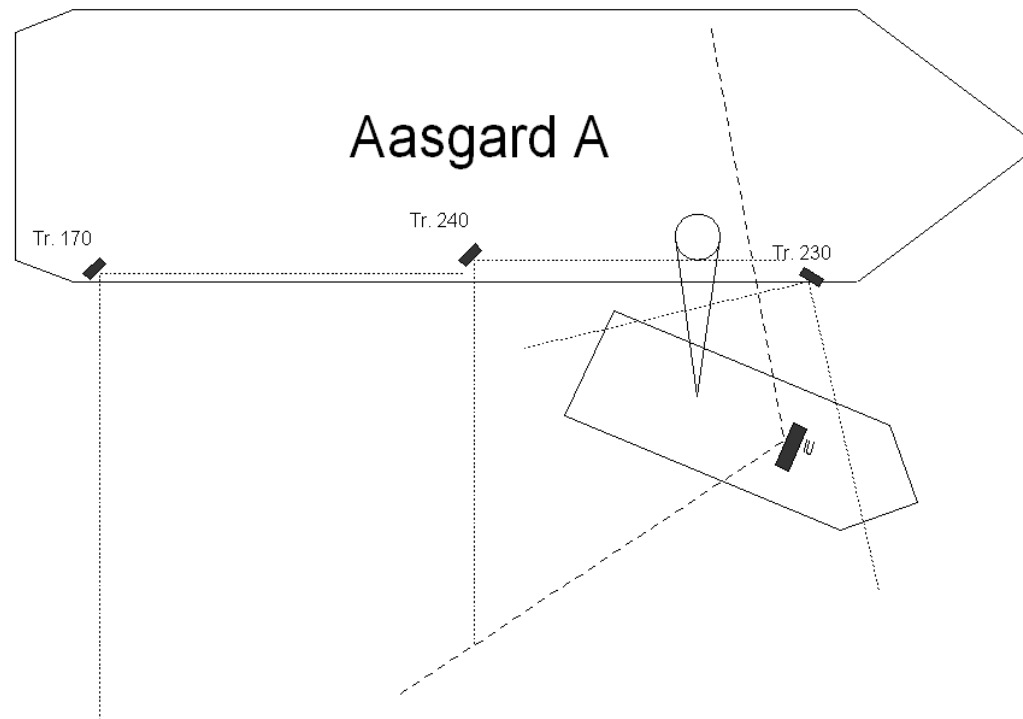


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Operating Scenario



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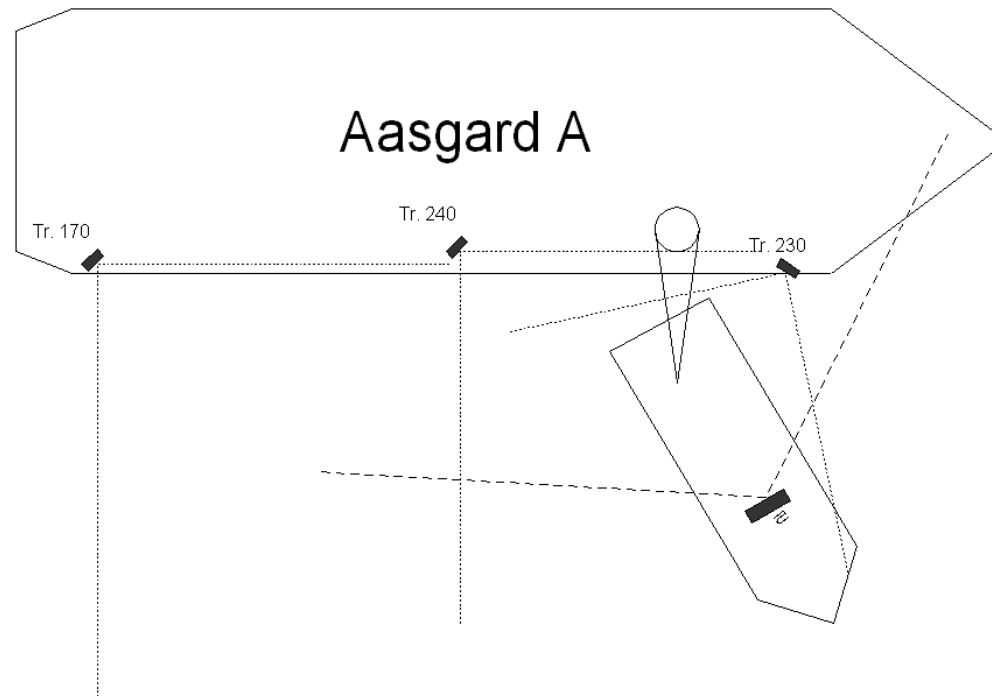


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Operating Scenario



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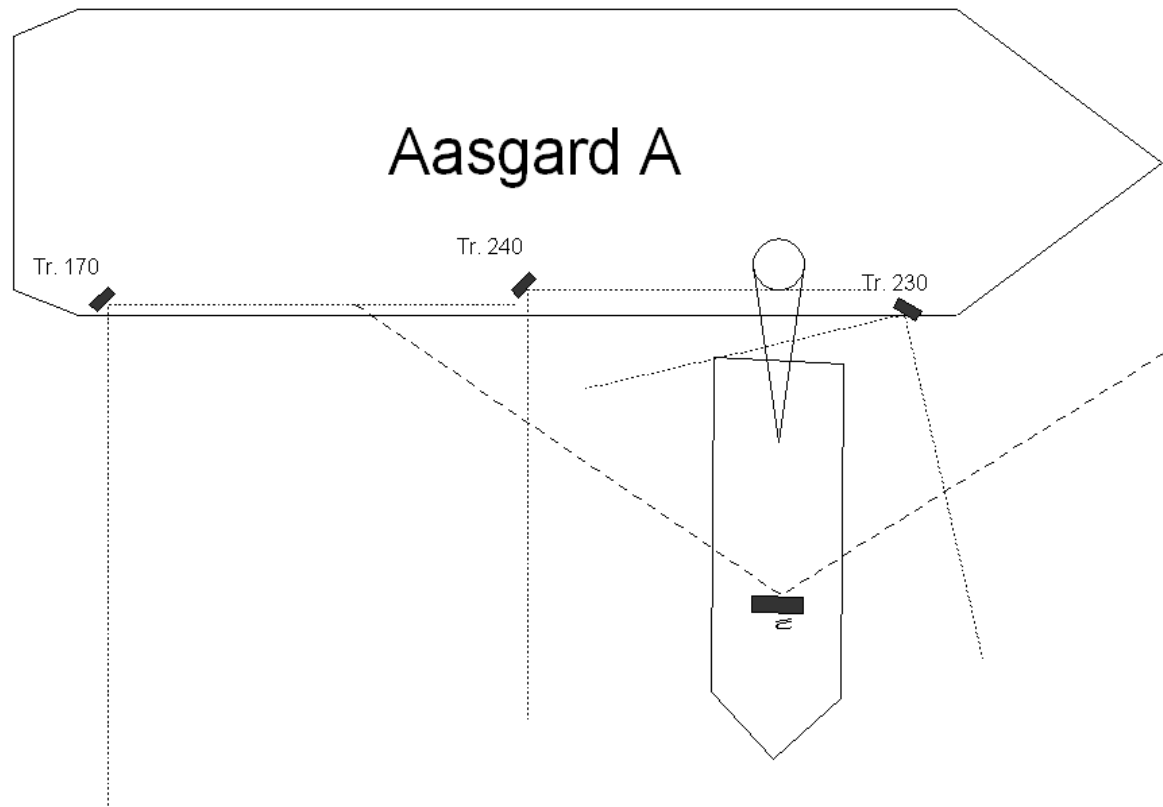


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Operating Scenario



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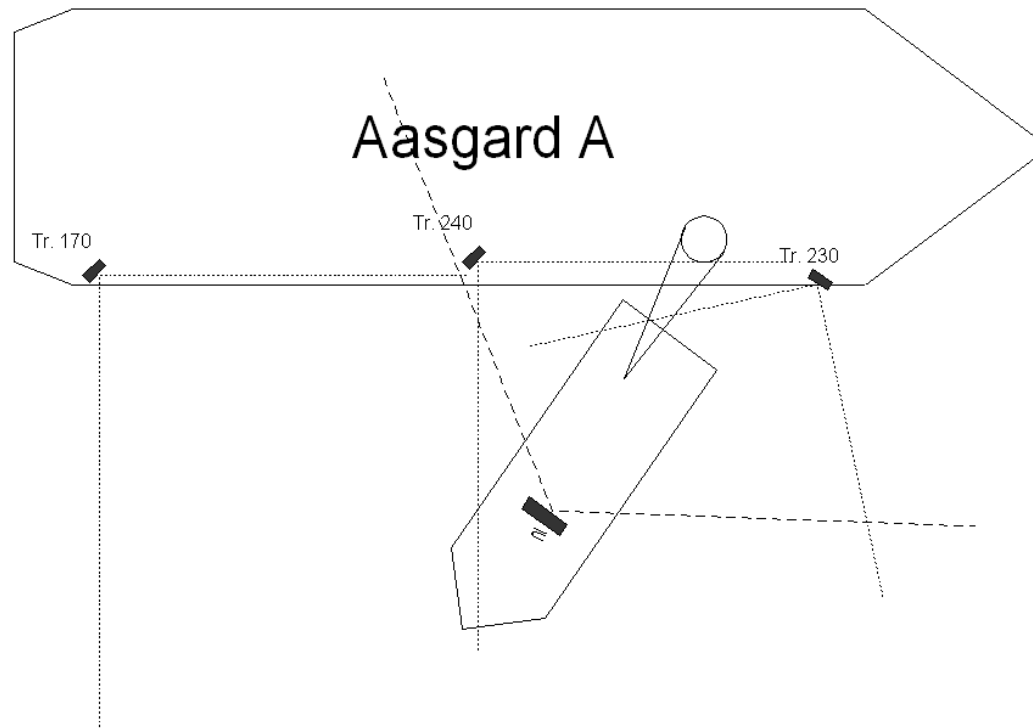


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Operating Scenario



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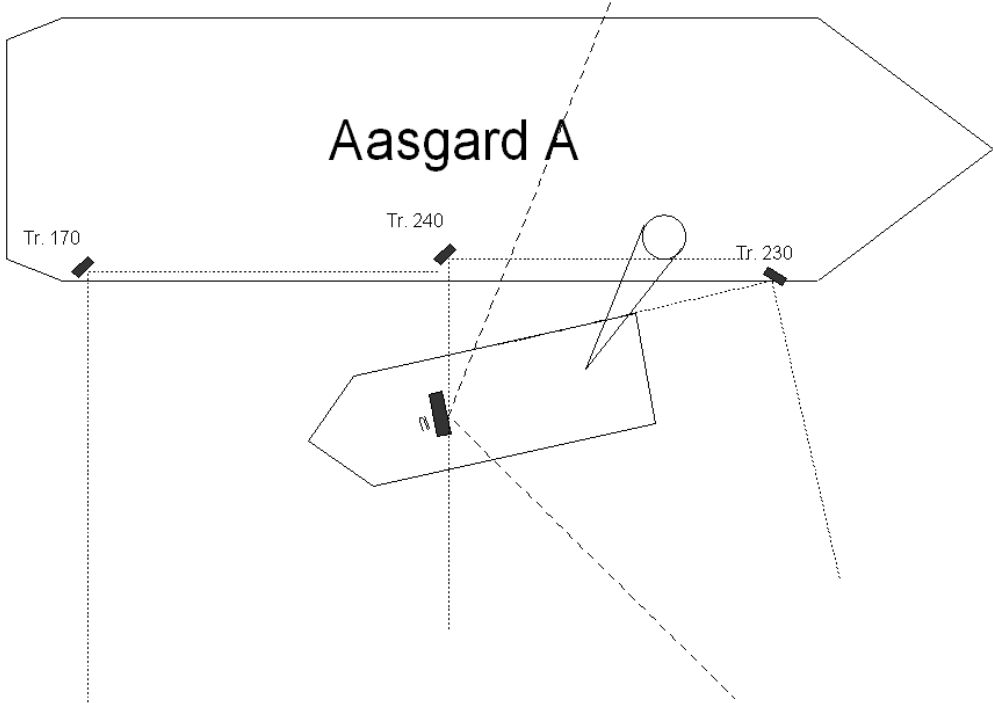


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Operating Scenario



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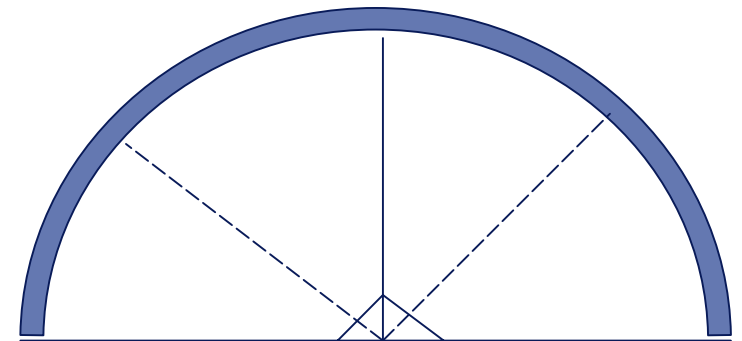
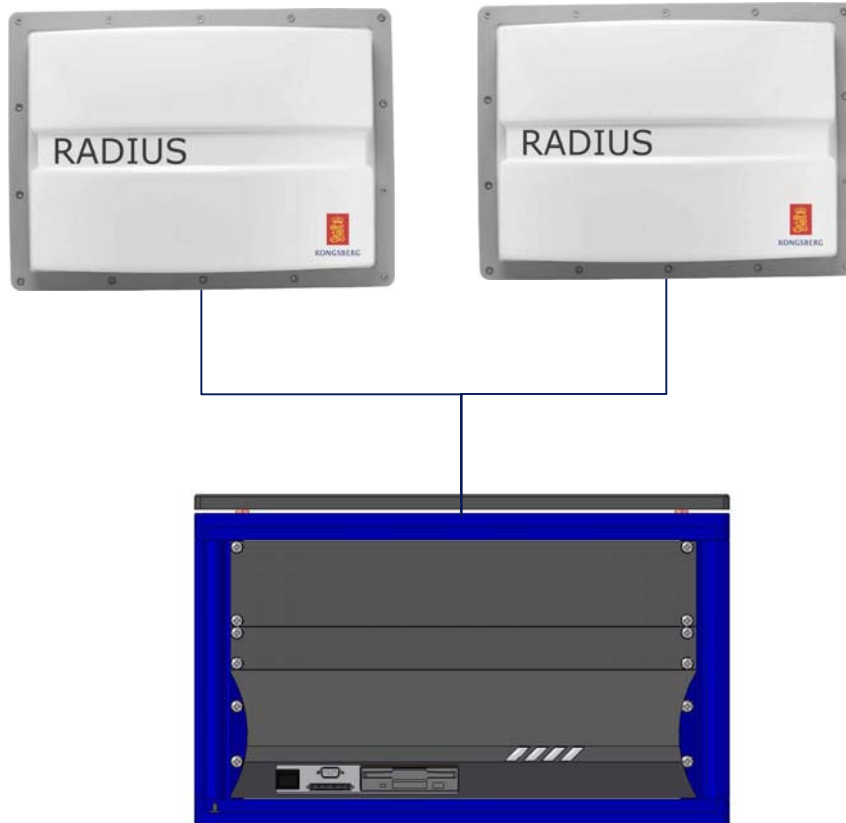
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RADius Modular Extension

Multiple interrogators



Extended sector

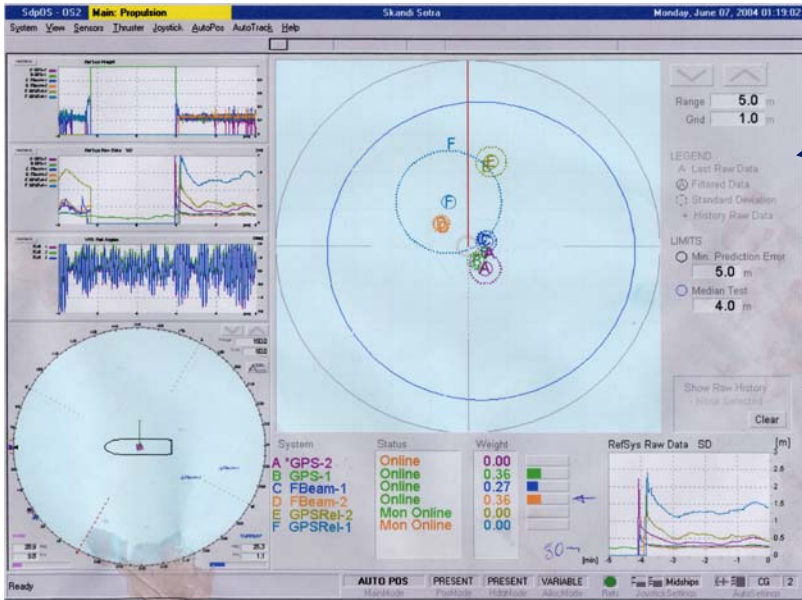
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Relative DP Operations, Relative Positioning Systems



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DP, Skandi Sotra



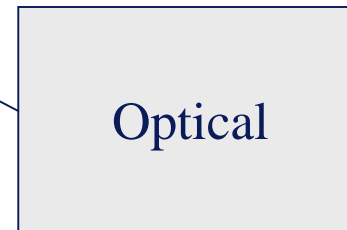
RADius
Relative



DARPS
Relative &
Absolute



DARPS
Relative &
Absolute



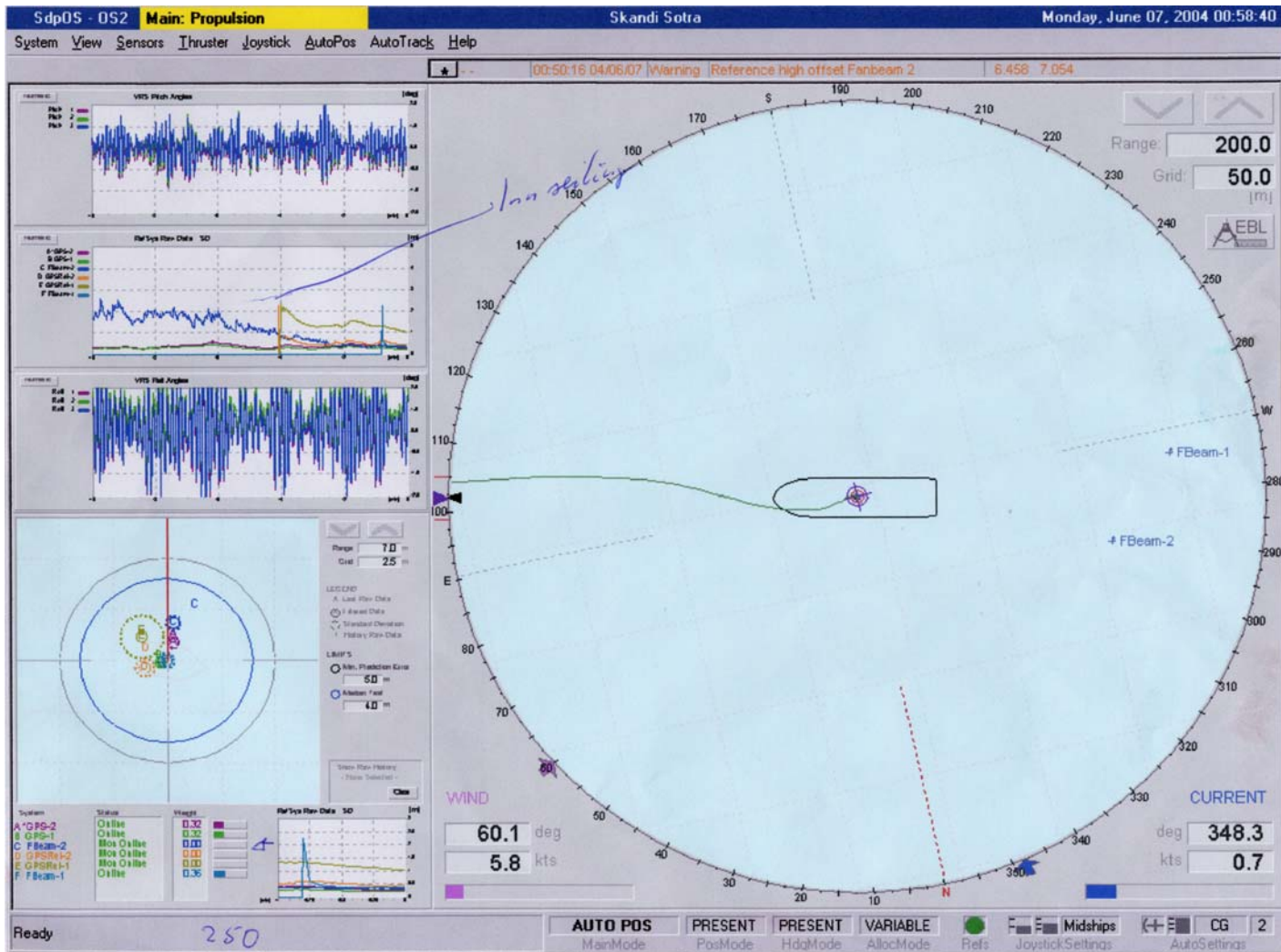
Relative

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Snap shot from DP, Skandi Sotra, Aasgard A



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Conclusion



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- 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



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