KONGSBERG

Acoustic Interference

Jan Erik Faugstadmo

Thor Husøy

Kongsberg Maritime AS

Dynamic Positioning Conference, Houston, September 28-30, 2004

arranged by

Dynamic Positioning Committee
Marine Technology Society

© KONGSBERG November 17, 2004

Presentation topics

KONGSBERG

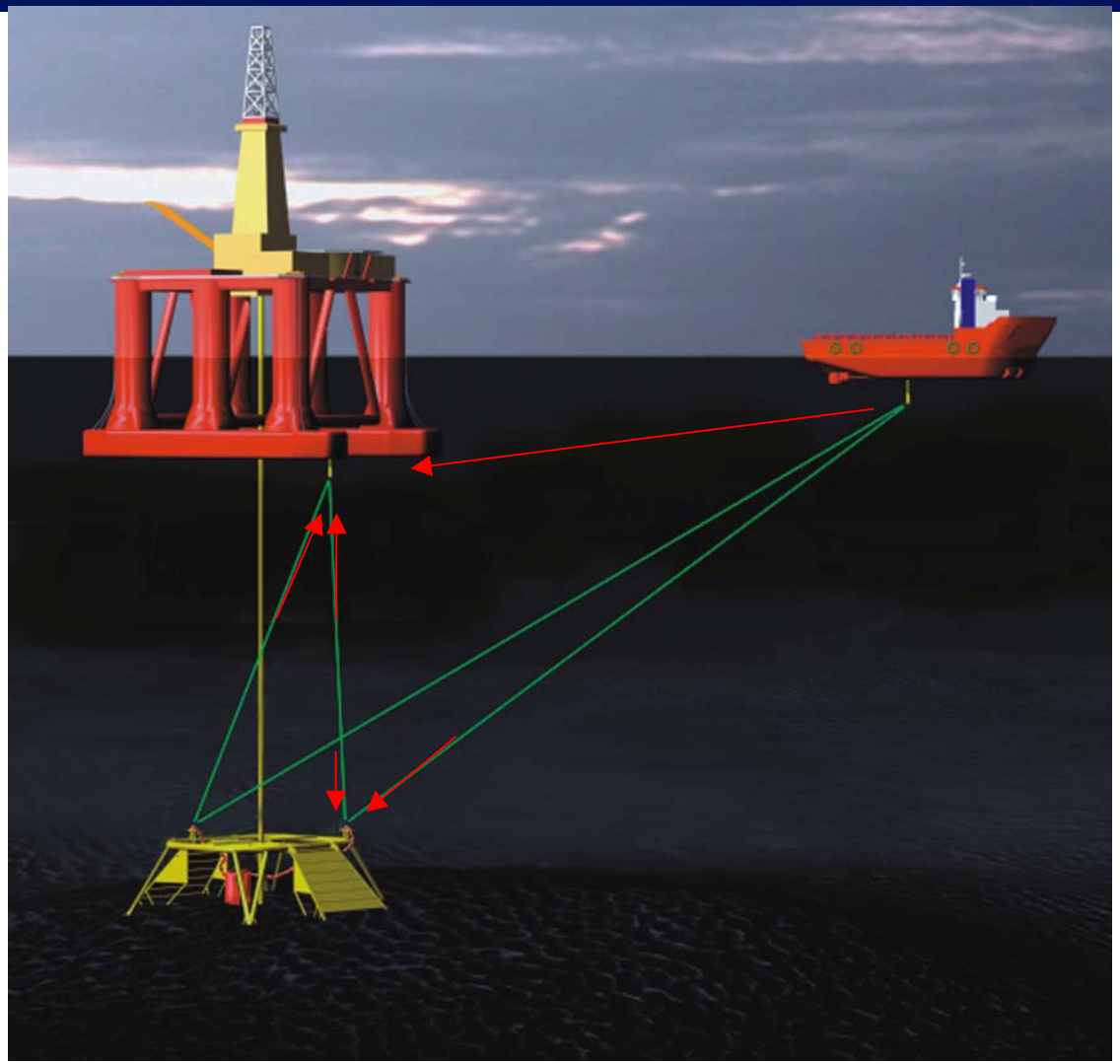
- Interference caused by other systems on one vessel or by systems on another vessels
  - Noise and multipath not discussed

- Interference on acoustic signals
- Consequences – reduced performance
- How to reduce acoustic interference?

© KONGSBERG November 17, 2004

Acoustic interference

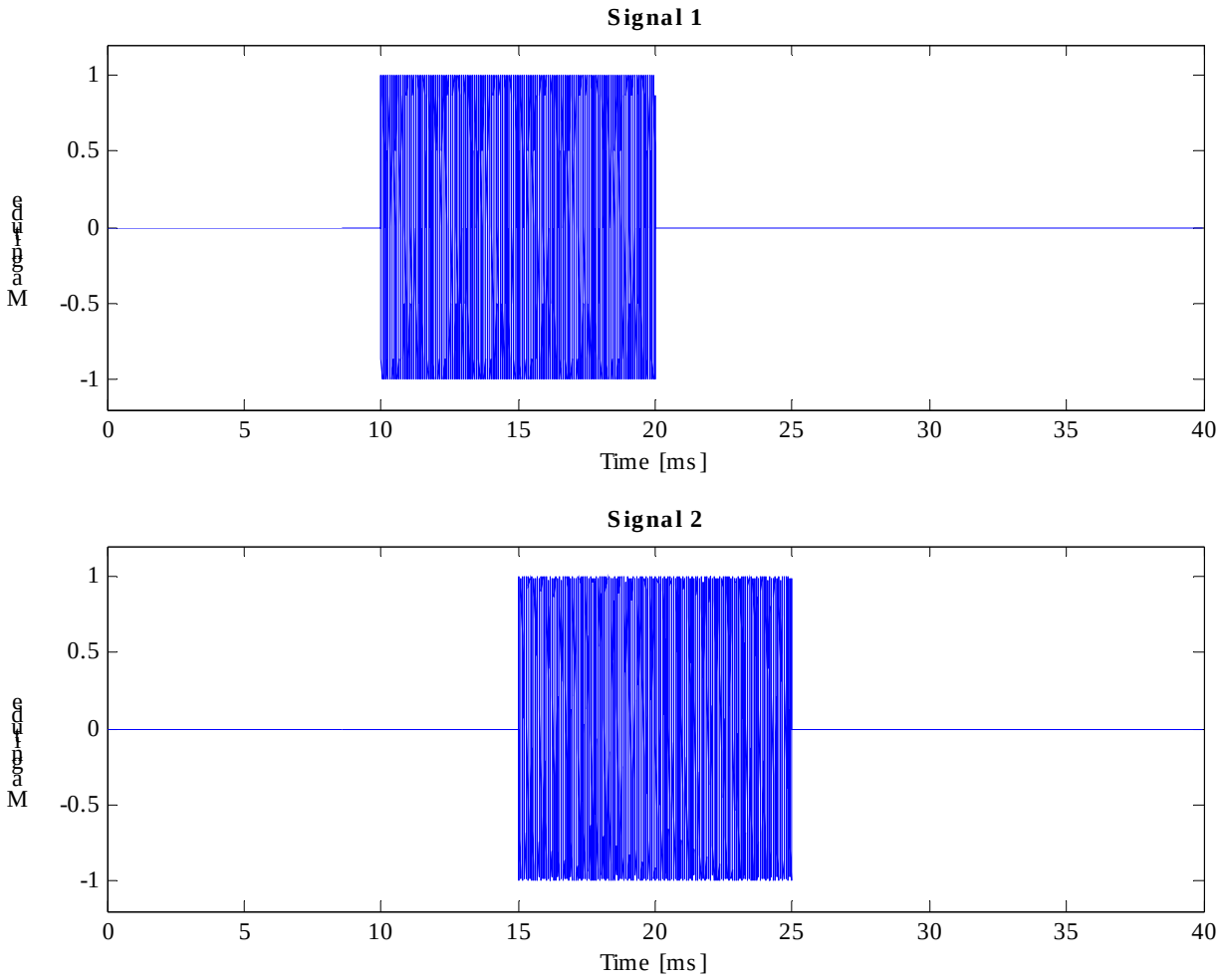
KONGSBERG



© KONGSBERG November 17, 2004

Two interfering signals 50% overlap

KONGSBERG



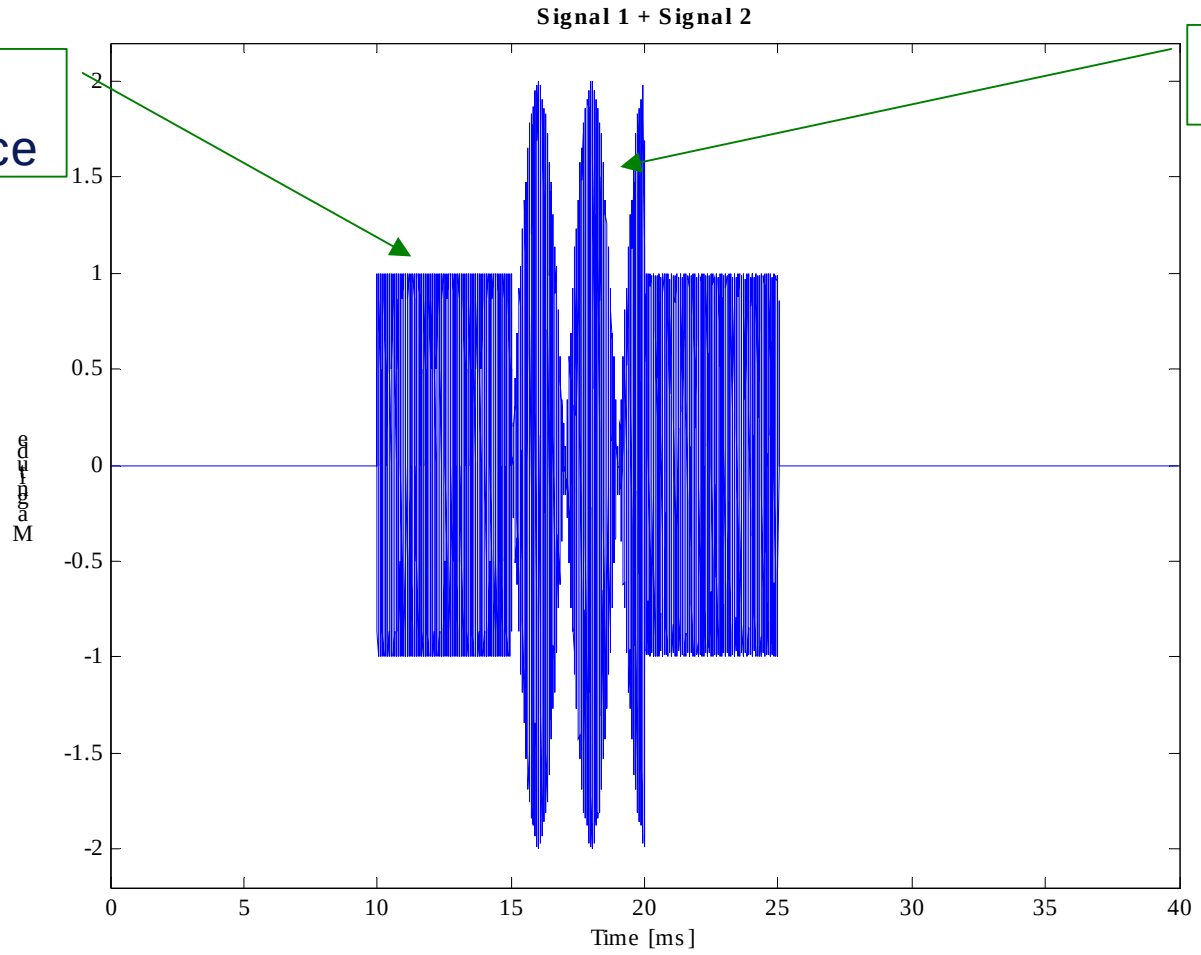
© KONGSBERG November 17, 2004

Receiver input signal; CW overlapping signal

KONGSBERG

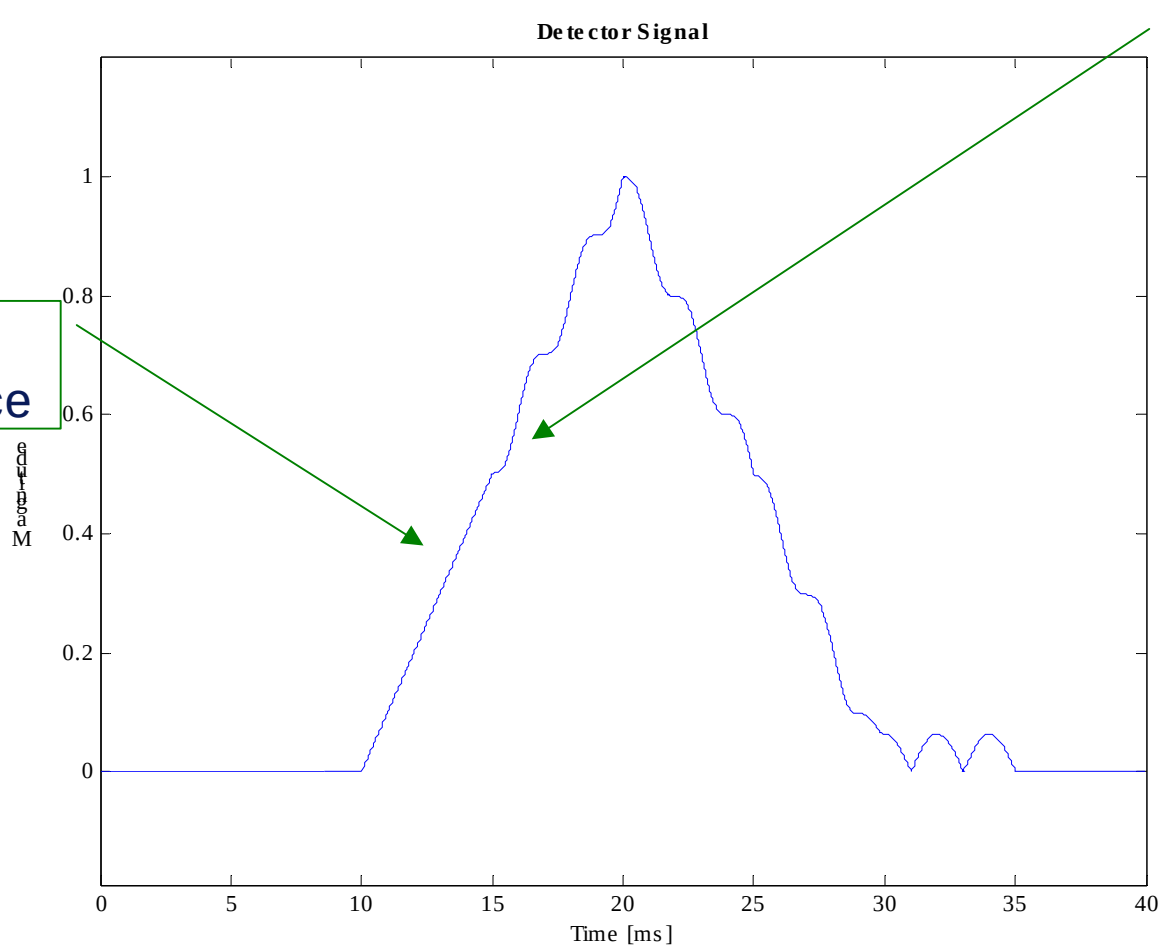
No interference

Interference



© KONGSBERG November 17, 2004

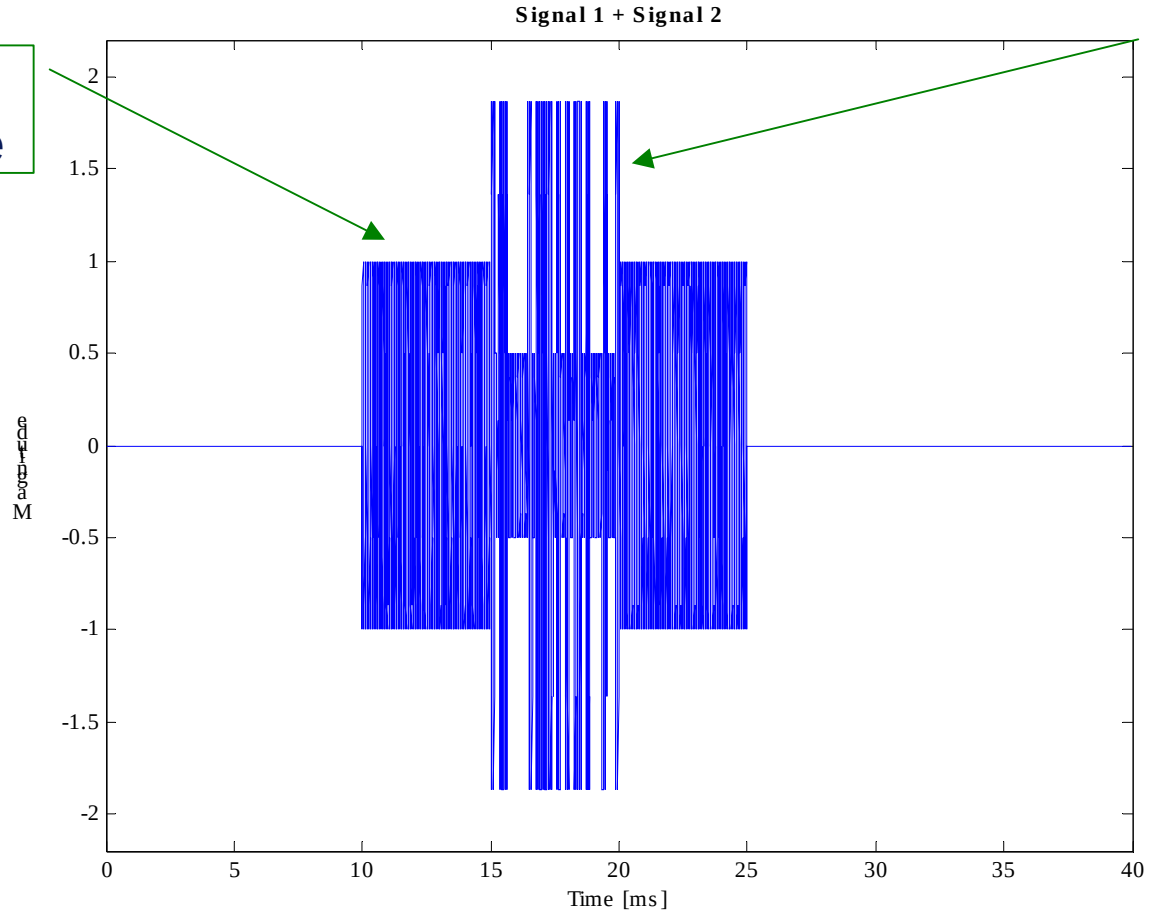
Detector input CW - overlapped signal



© KONGSBERG November 17, 2004

Receiver input signal; DSSS overlapped signal

No interference

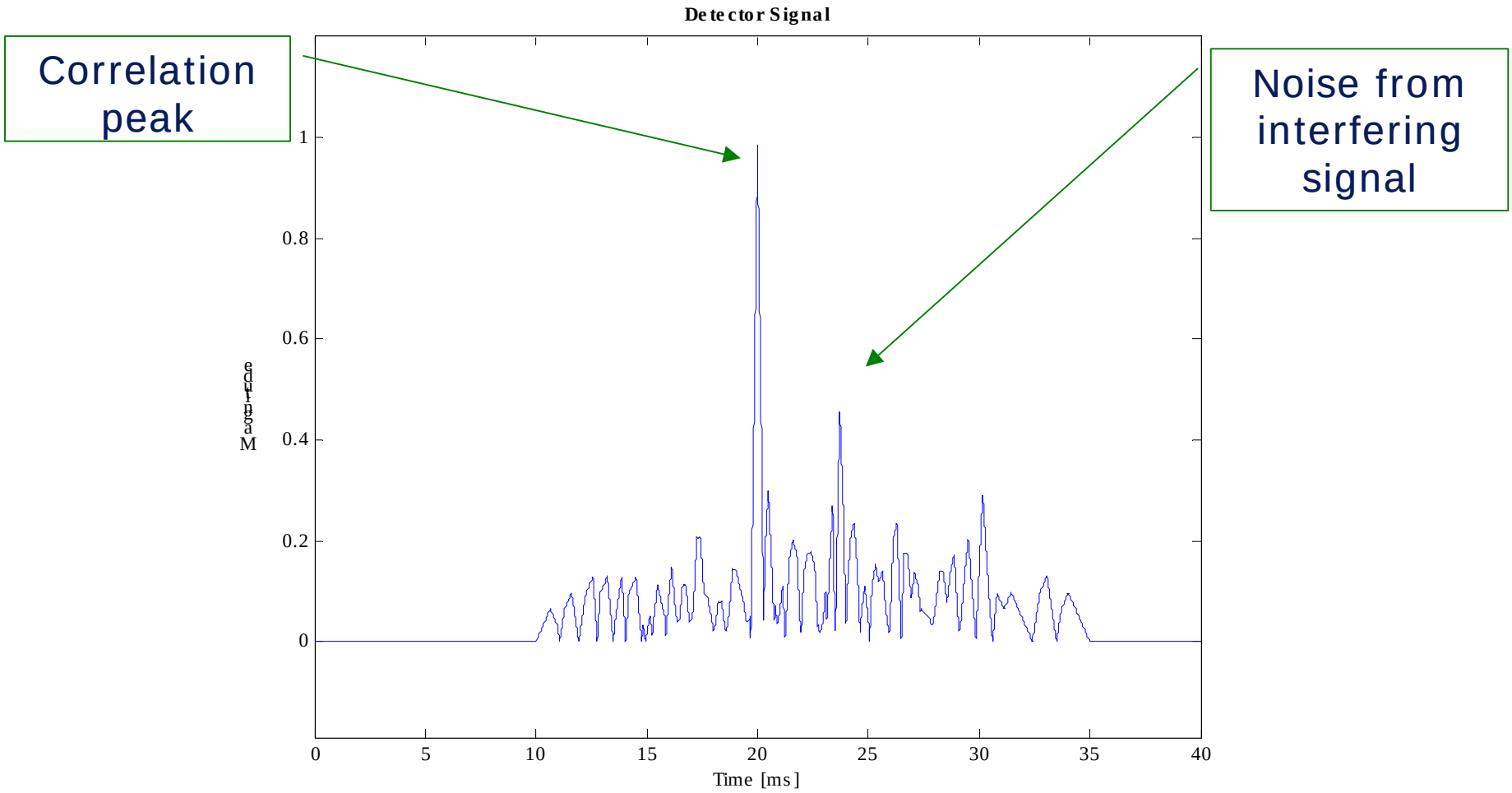


Interference

© KONGSBERG November 17, 2004

Detector input; DSSS Overlapped signal

KONGSBERG

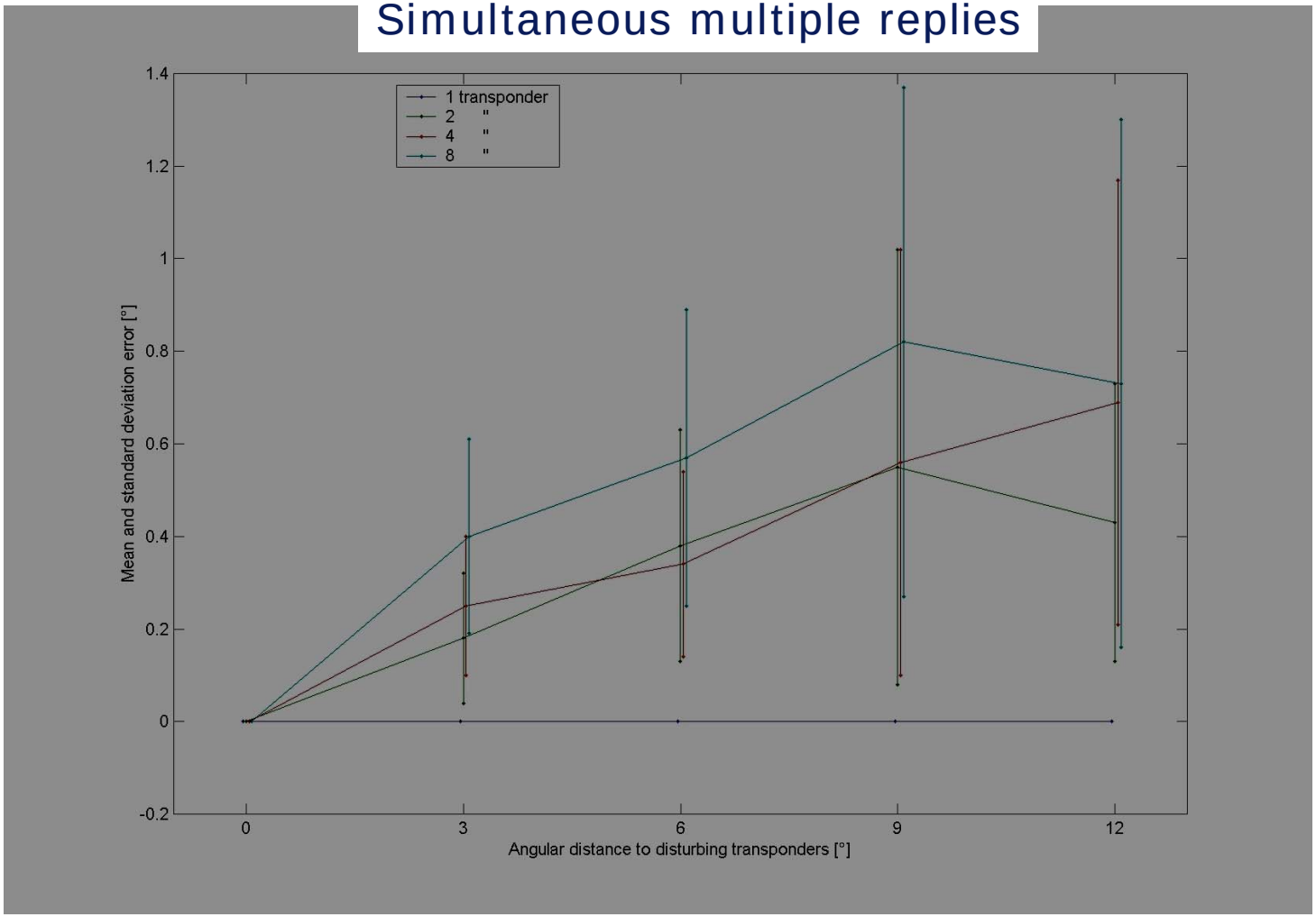


© KONGSBERG November 17, 2004

Interference; Impact on directional measurement

KONGSBERG

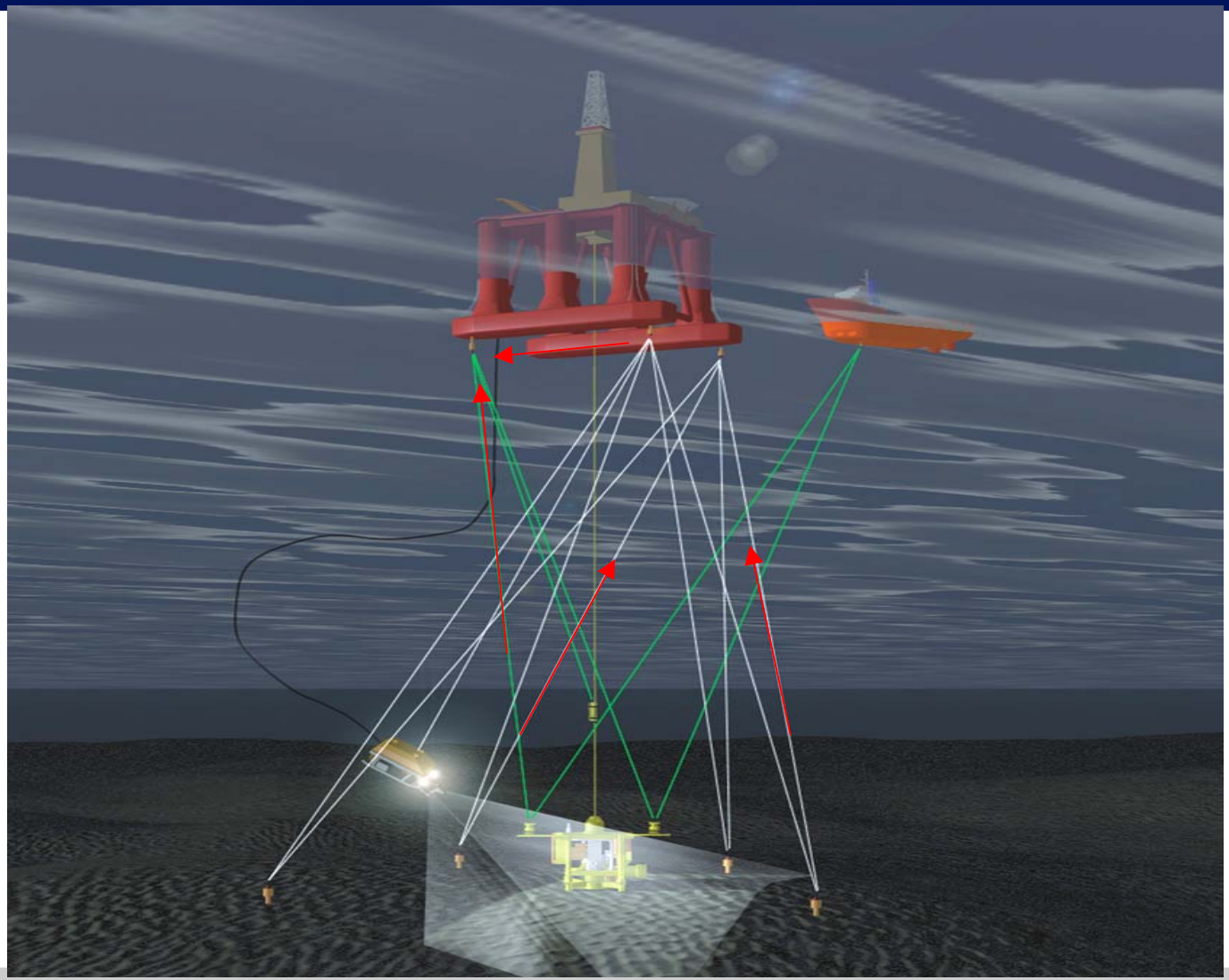
Simultaneous multiple replies



© KONGSBERG November 17, 2004

Intra system Acoustic Interference

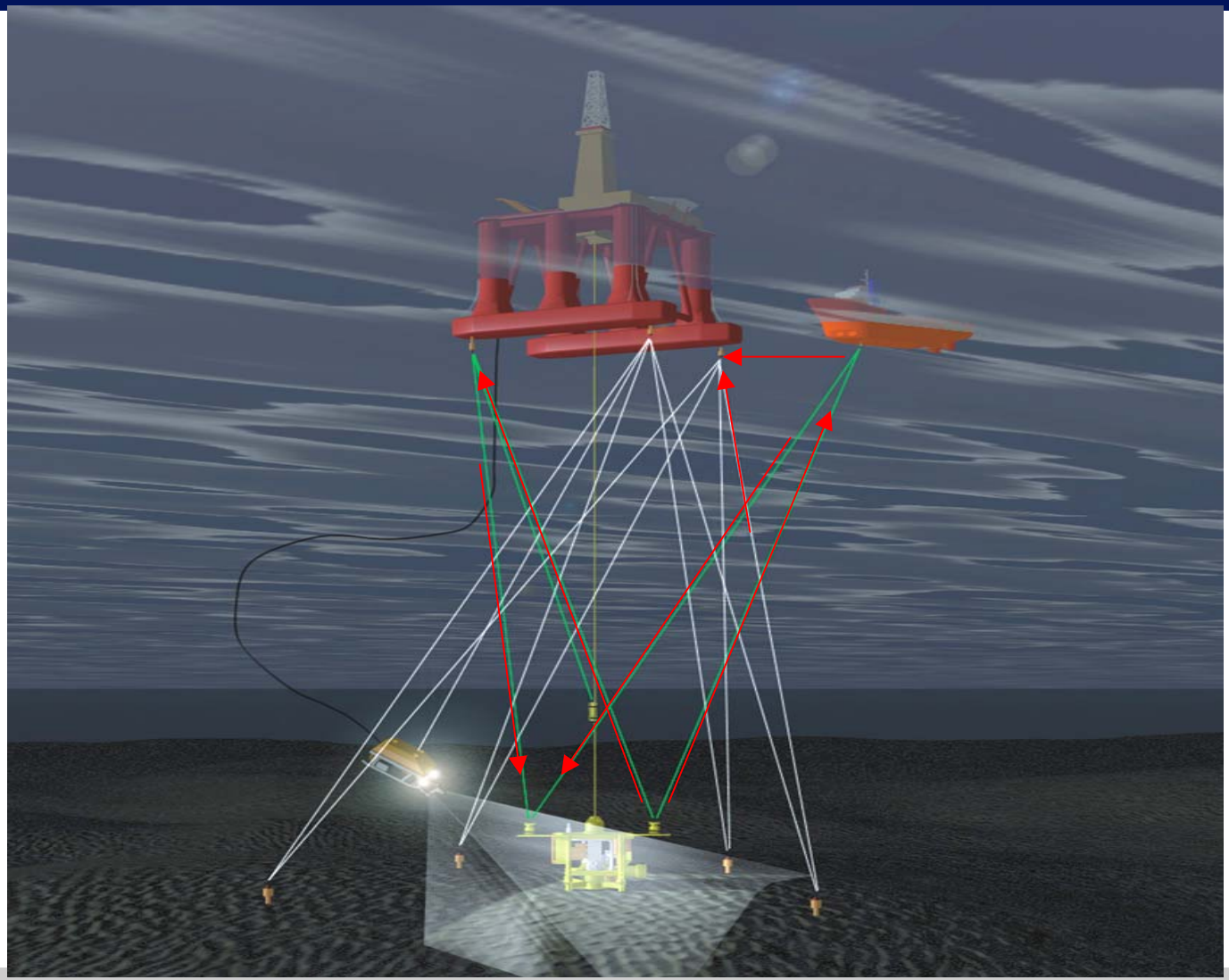
KONGSBERG



© KONGSBERG November 17, 2004

Inter system Acoustic interference

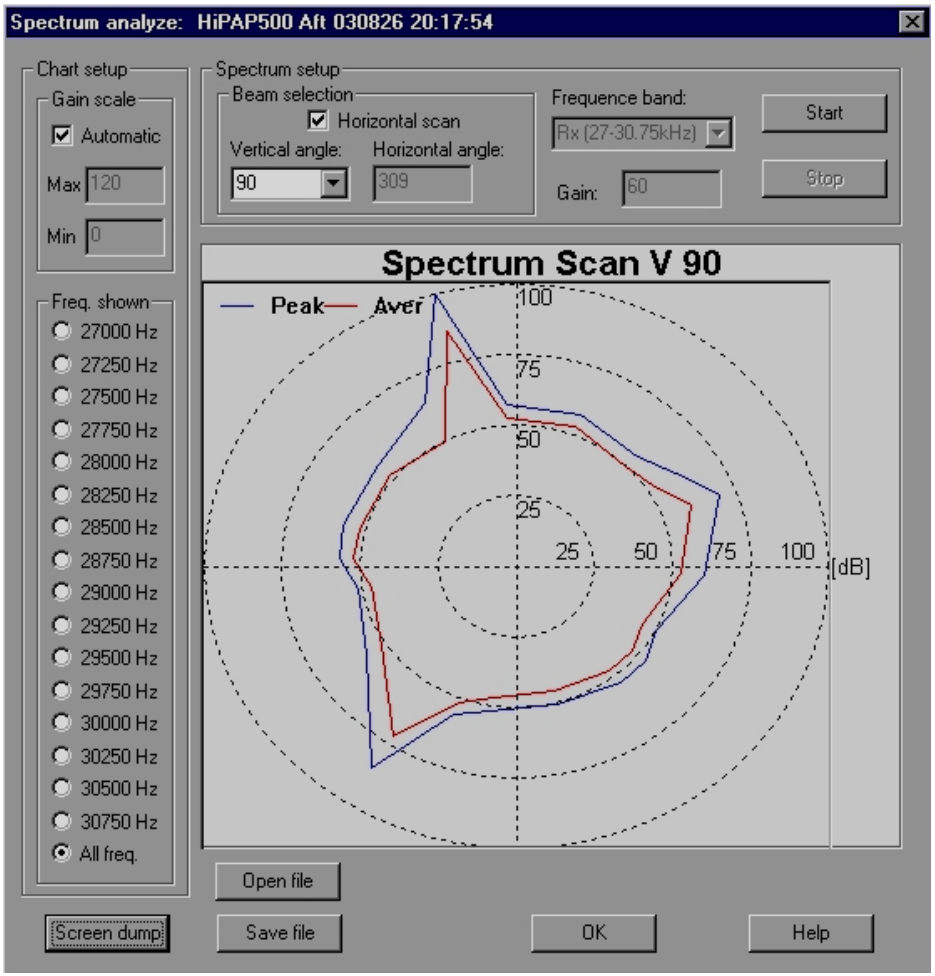
KONGSBERG

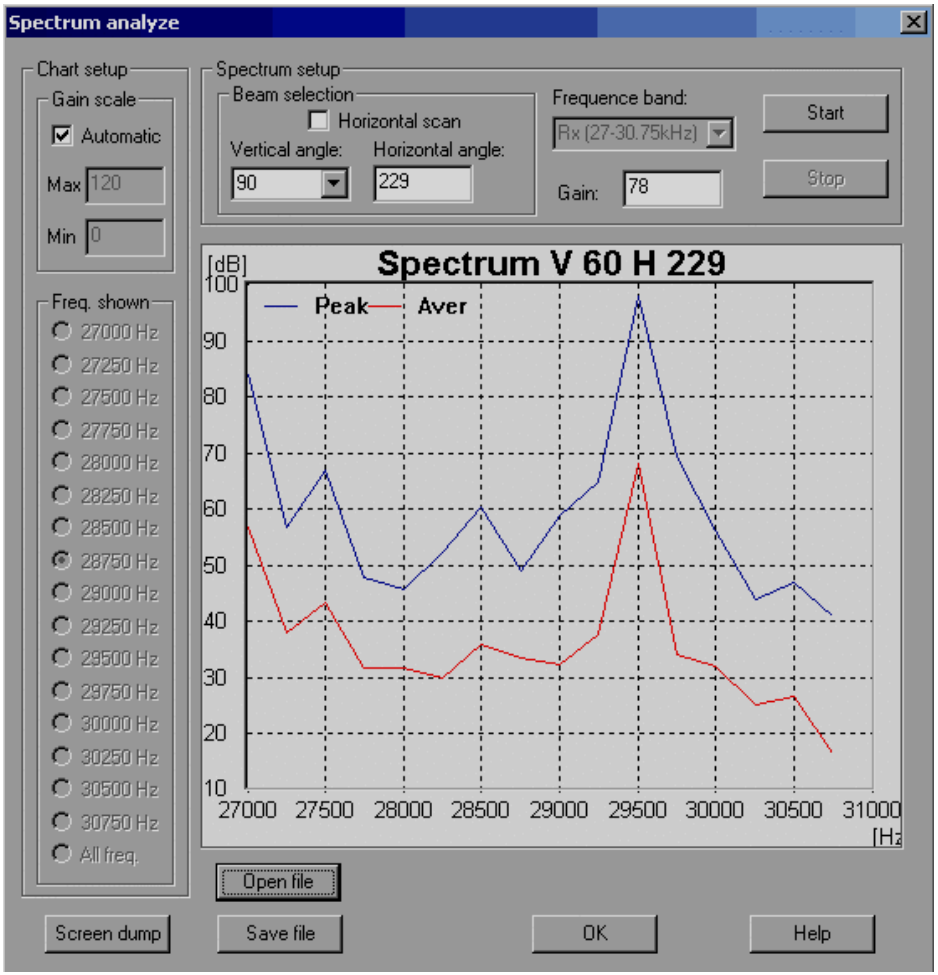


© KONGSBERG November 17, 2004

Level & direction of received noise/interference

KONGSBERG





© KONGSBERG November 17, 2004

Consequences for DP operation

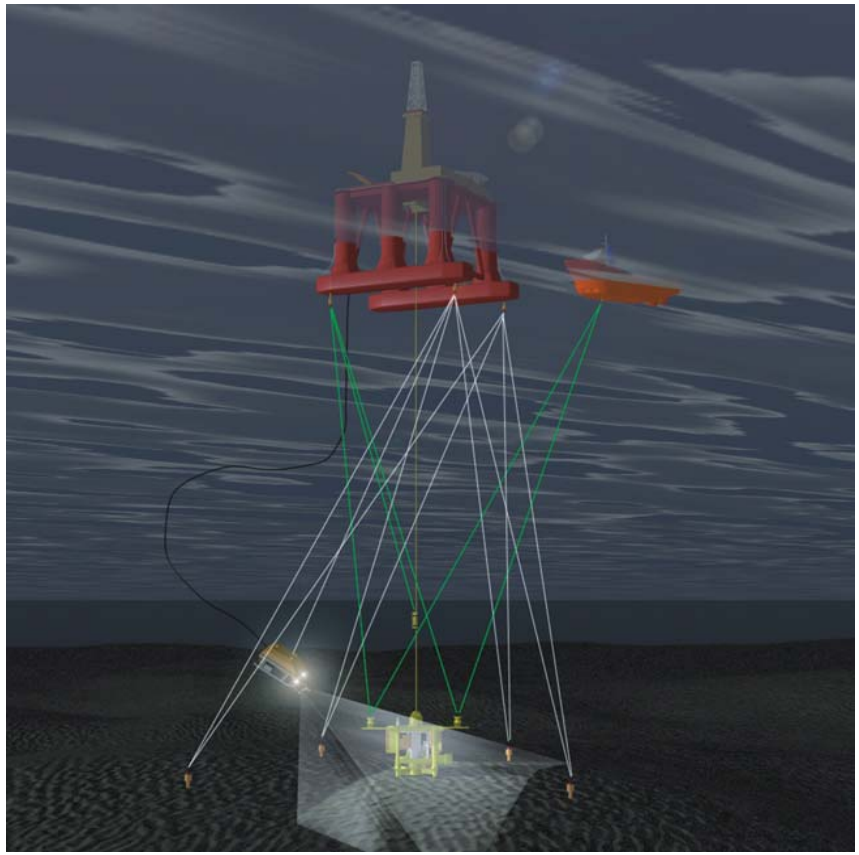
- Total loss of signal – no position
- Reduced accuracy – standard deviation increased
- Very unstable position – large position jumps
- Lock on wrong transponder – erroneous position

© KONGSBERG November 17, 2004

Reducing acoustic interference

KONGSBERG

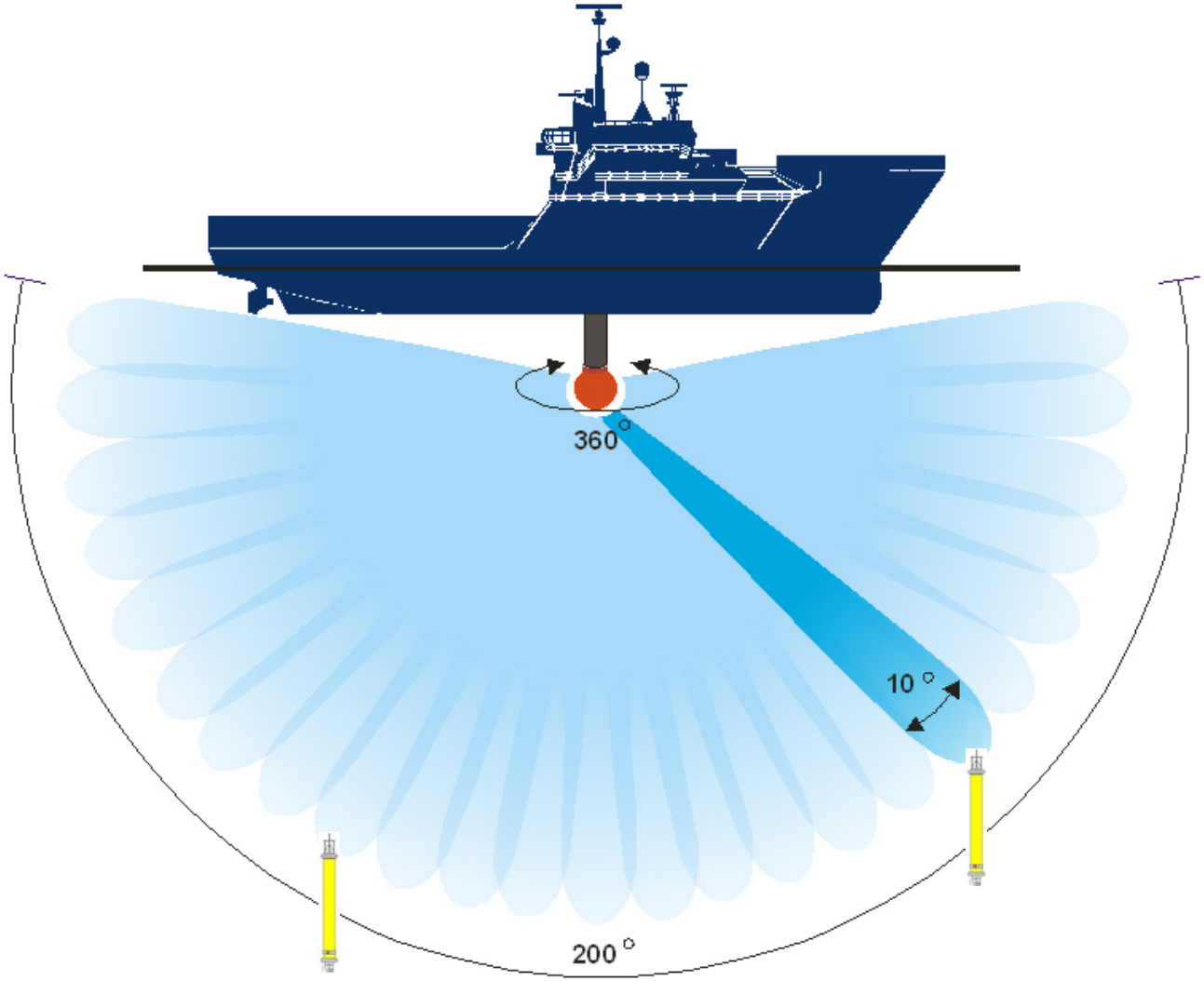
- Directivity on transmission and reception
- High channel separation
- Reduce number of transponders utilized
- Reduce interrogation rate



© KONGSBERG November 17, 2004

Narrow pointing beams

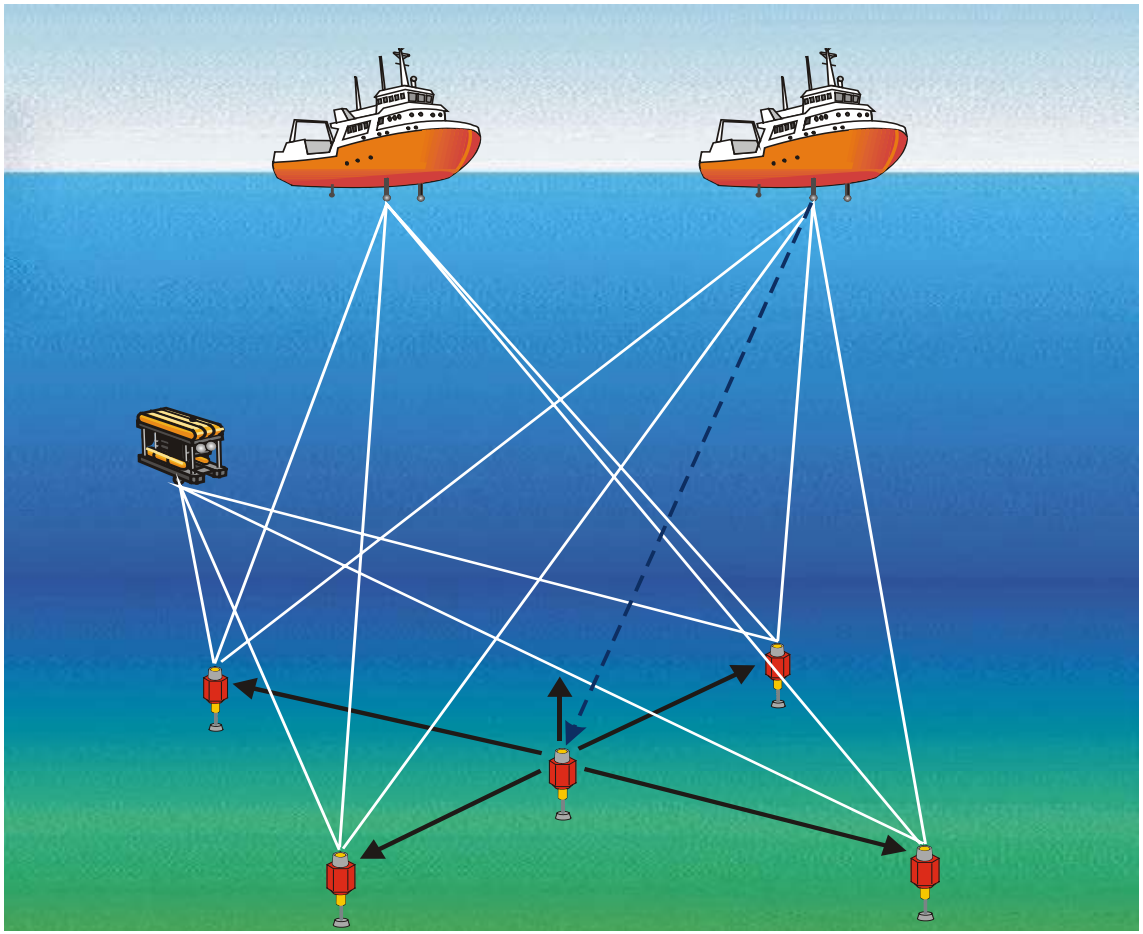
KONGSBERG



© KONGSBERG November 17, 2004

Multi User LBL

KONGSBERG

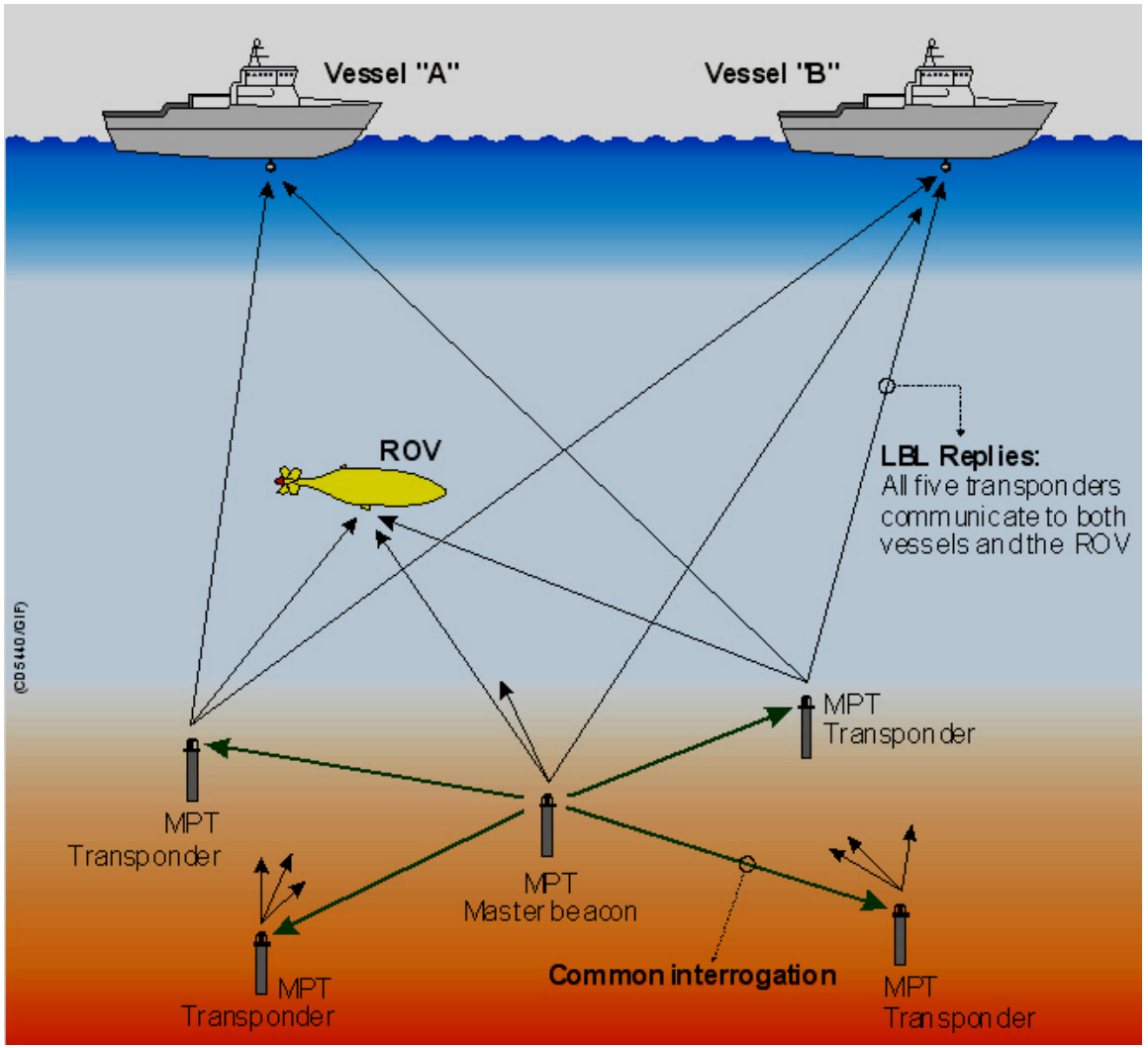


Several vessels uses the same transponder array

(CD4011)

© KONGSBERG November 17, 2004

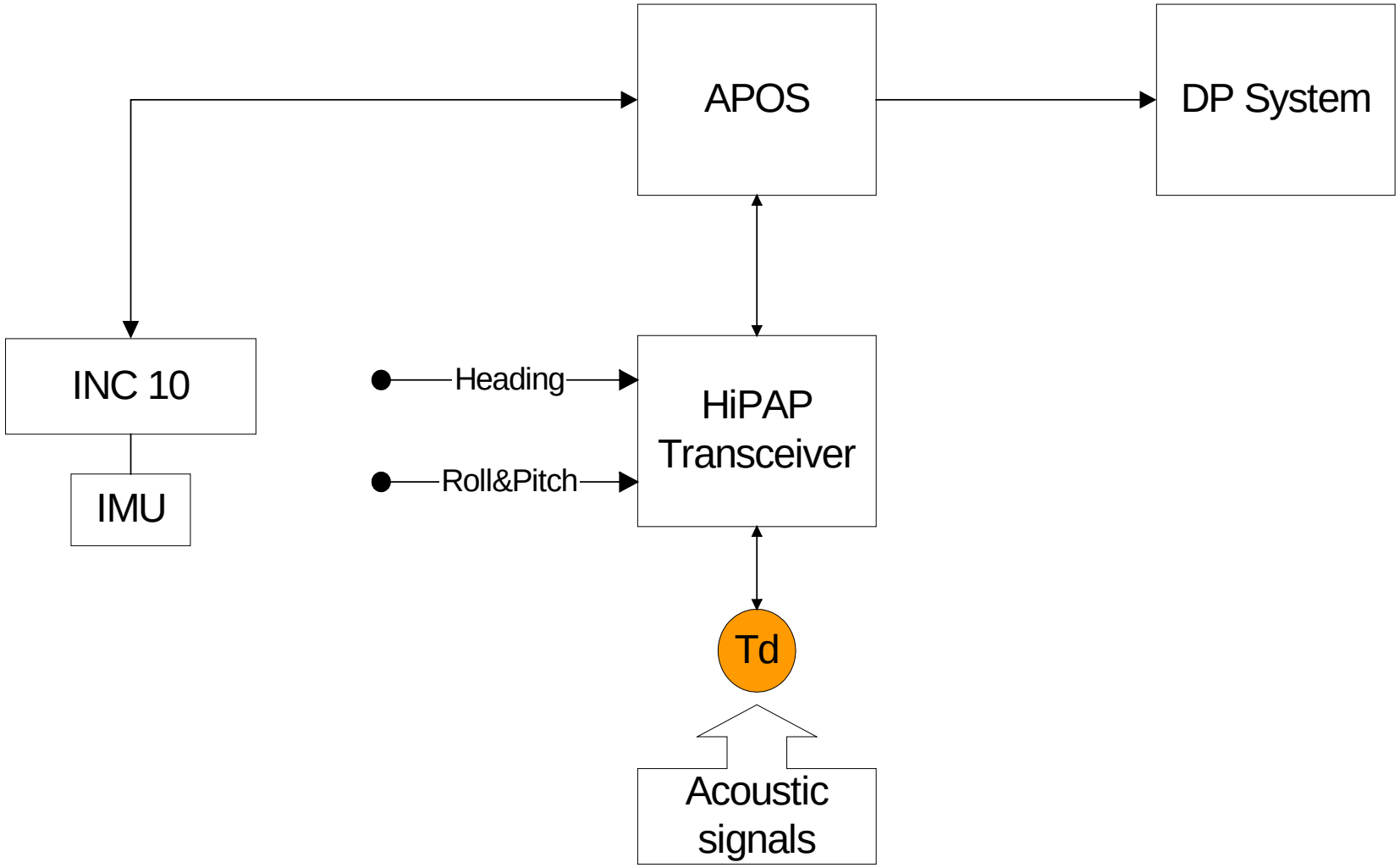
Multi User LBL



© KONGSBERG November 17, 2004

Hydro-acoustic Aided Inertial Navigation; HAIN

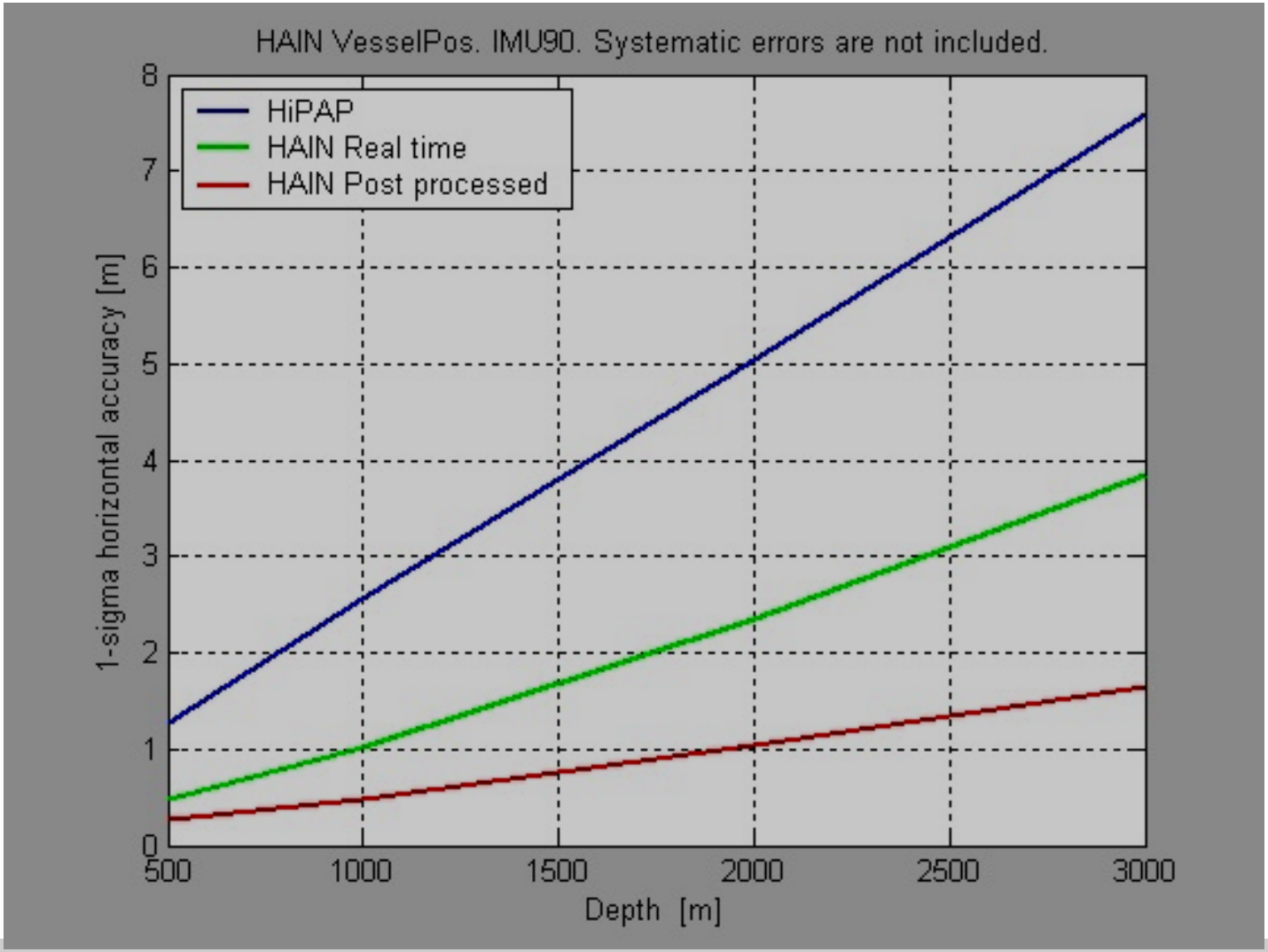
KONGSBERG



© KONGSBERG November 17, 2004

HAIN Accuracy. 1nmi/h IMU

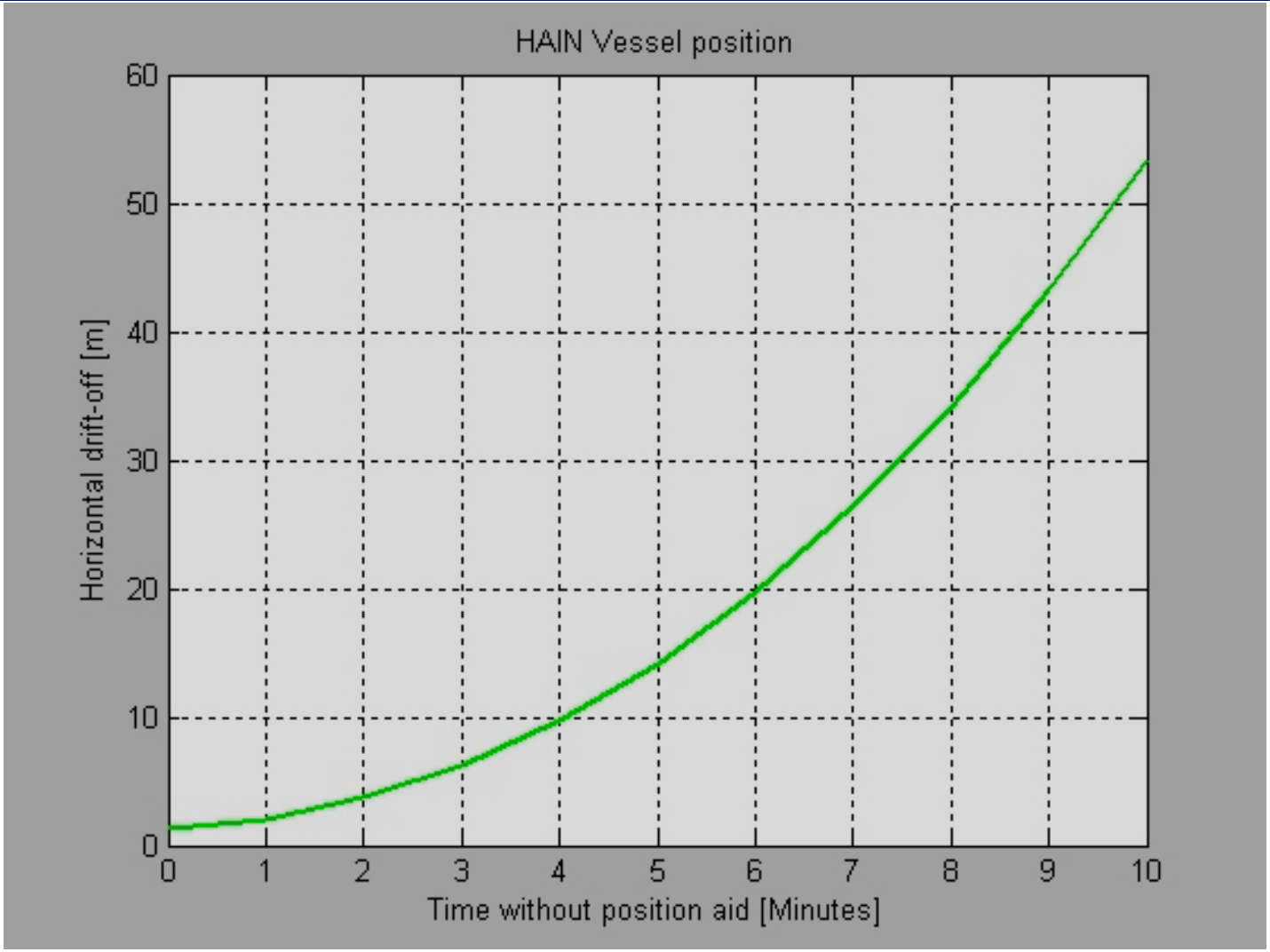
KONGSBERG



© KONGSBERG November 17, 2004

HAIN Accuracy during HiPAP dropout.

KONGSBERG

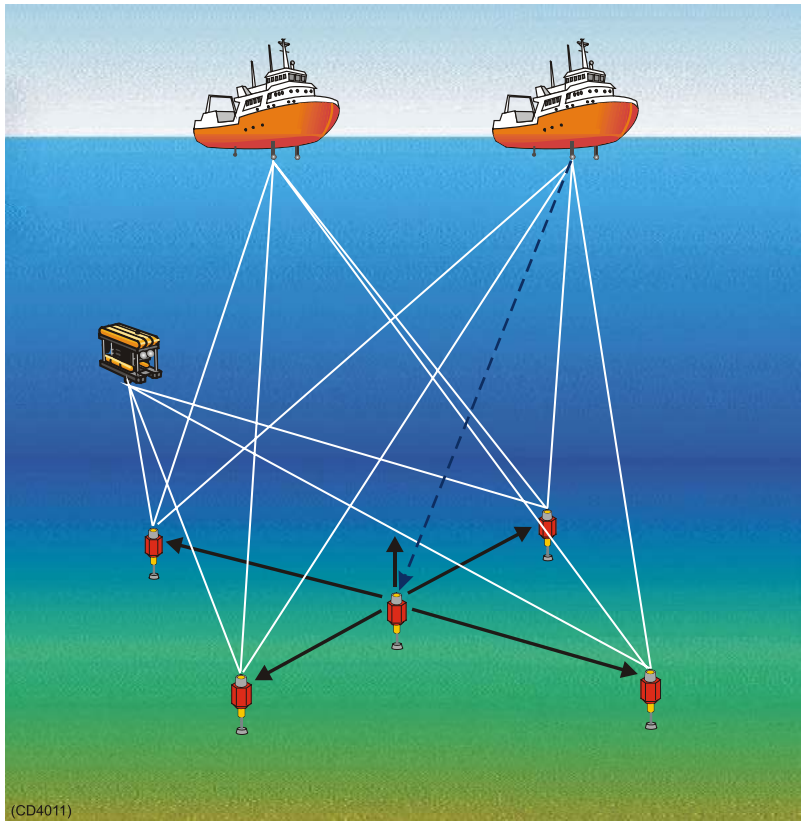


© KONGSBERG November 17, 2004

Summary

- Planning and coordination
- System knowledge
- New functions / products can help

- Questions?



© KONGSBERG November 17, 2004