



## PHINS, an all-in-one sensor for DP applications

DP conference, Houston  
September 28-30, 2004

IXSEA S.A.S.

[info@ixsea.com](mailto:info@ixsea.com)

[www.ixsea.com](http://www.ixsea.com)

Confidential  
IXSEA

# INTRODUCTION

- ▶ Positioning sensor is one of the key elements of DP systems
- ▶ DGPS is a great positioning system but it may be subject to some interruptions in service:
  - Scintillation effects
  - Signal masking
  - Multipath

# INTRODUCTION

- ▶ Continuity, integrity and availability are the characteristics needed for the positioning reference system.
- ▶ Complementing DGPS with additional sensors is a solution:
  - PHINS, an inertial navigation system
  - GAPS a compact, portable calibration free acoustic position system

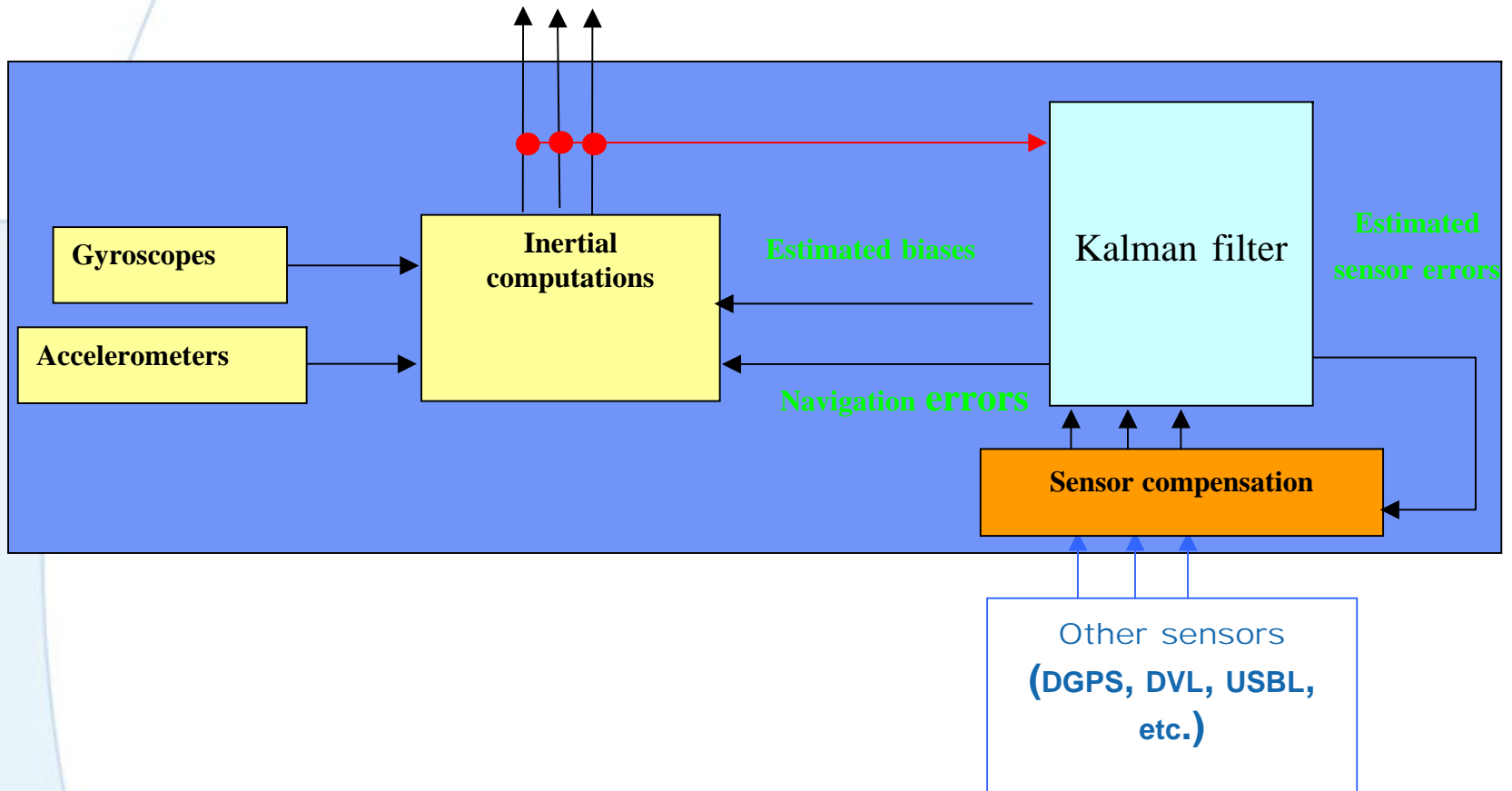
# PHINS, a Fiber Gyro Navigation System



- ▶ Small, light
- ▶ Provides :
  - Position
  - Roll, Pitch
  - Heading
  - Heave, Altitude
  - Rate of turn

# PHINS

Attitude, positions, speeds



# PHINS

GPS data



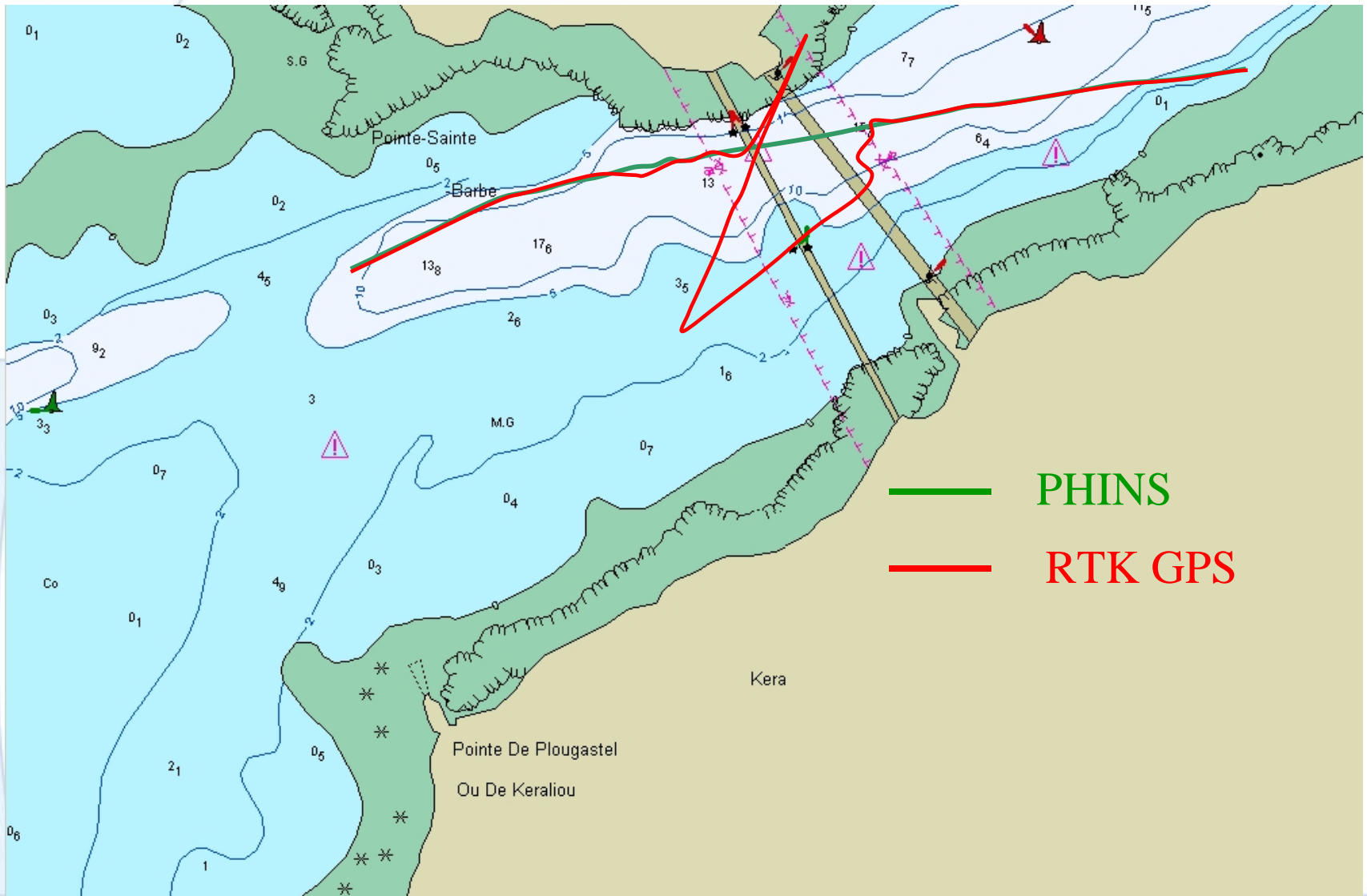
DVL data



USBL data



Optimal  
Position  
data



# PHINS

~~GPS data~~

DVL data

USBL data



Optimal  
Position  
data



# PHINS TEST RESULTS

**Phins #27 \_ Test # 22**  
**Position error (DVL aiding)**



# PHINS

~~GPS data~~

~~DVL data~~

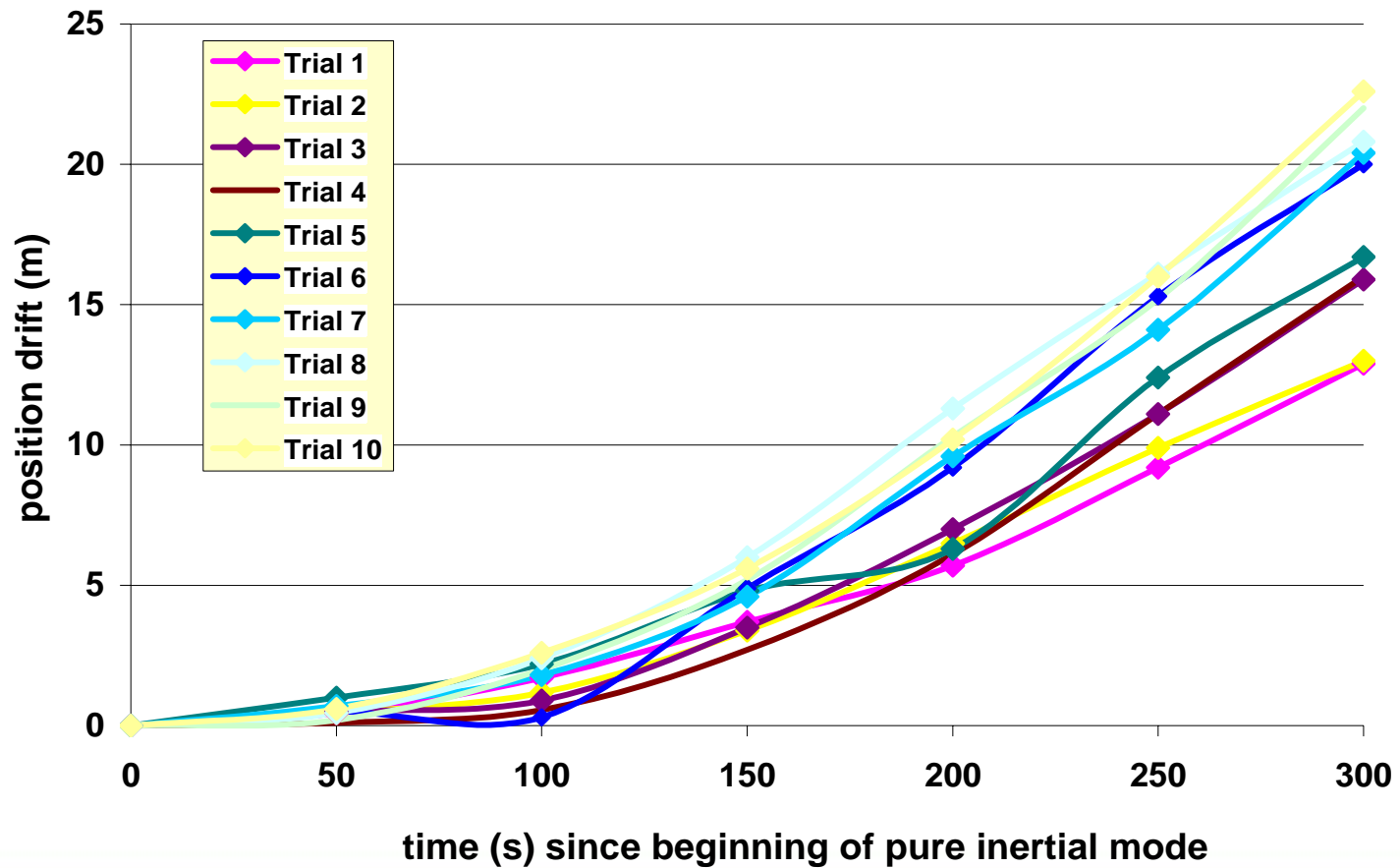
~~USBL data~~



Optimal  
Position  
data

# PHINS test results

Position drift in pure inertial mode (no GPS aiding, no DVL aiding)



# PHINS

DGPS 1

DGPS 2

DVL

USBL

PHINS

DP  
Control system

DGPS like  
interface



## PHINS

- ▶ Detects and rejects any DGPS position jump
- ▶ Able to maintain 2 meter accuracy for one hour with DVL aiding
- ▶ Can use USBL data and no GPS at all for eliminating common mode errors
- ▶ Provides data at high rate (up to 100 Hz)

# GAPS



- ▶ USBL :
- ▶ Contains :
  - 3D acoustic antenna
  - Broadband signal processing
  - FOG based navigation system
  - Kalman filter

## GAPS

- ▶ Single, minimally sized housing
- ▶ Free of calibration
- ▶ Improved accuracy and higher acoustic position update rate
- ▶ Short time update of subsea positions during acoustic drop-out
- ▶ Complete acoustic coverage with tracking close to surface
- ▶ Robust to GPS outage
- ▶ Cost savings and outstanding value-for-money for hardware and performance

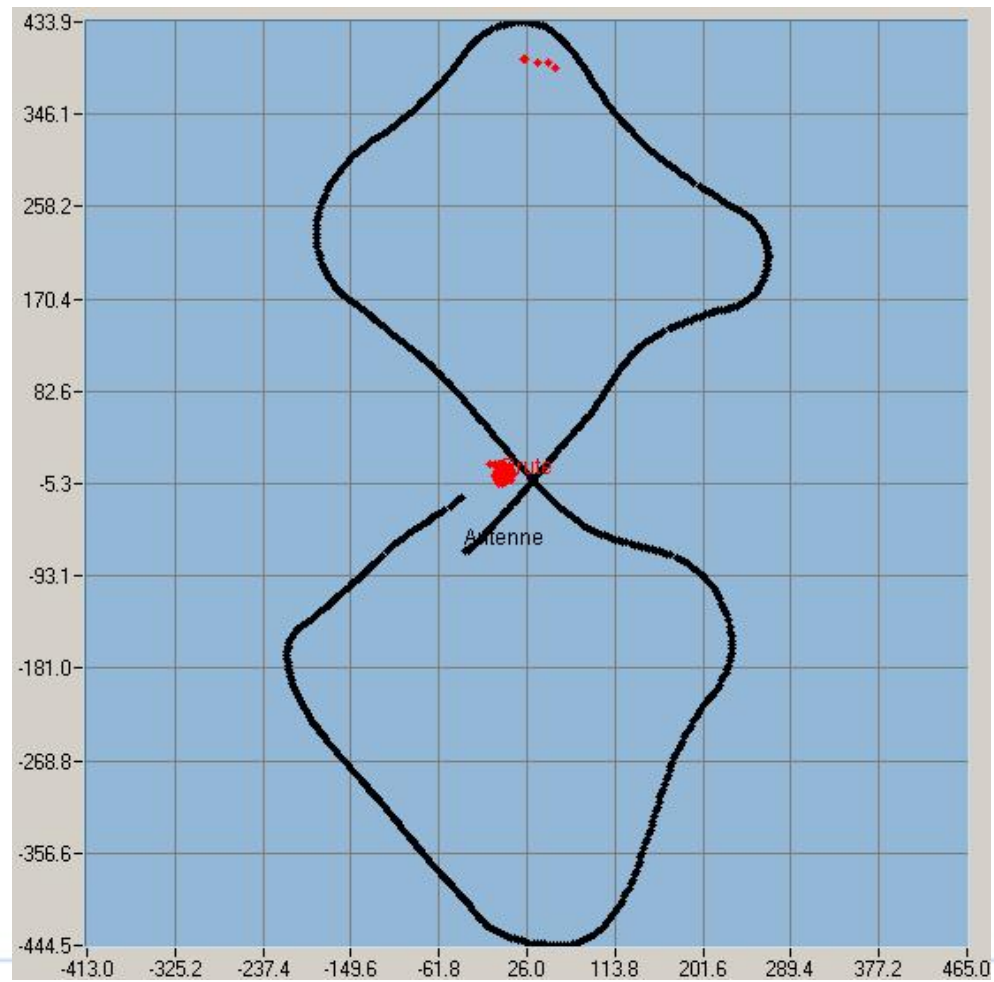


## GAPS

- ▶ Operates in the 19-30 KHz frequency range
- ▶ 4000 meters range
- ▶ Accuracy : 0.2 % of slant range

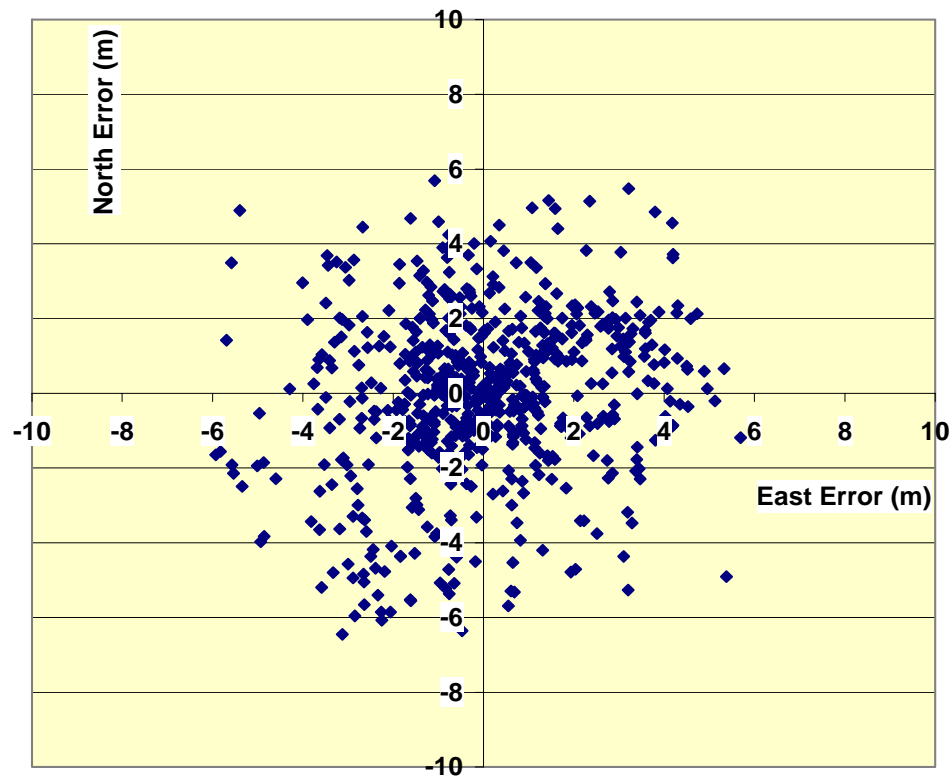


# GAPS TESTS RESULTS



# GAPS TEST RESULTS

GAPS : Transponder Position Error



## GAPS USE

- ▶ The beacon is moored
- ▶ While DGPS is available, GAPS computes automatically beacon position
- ▶ When DGPS no more available, GAPS computes vessel position using beacon position and acousti measurements.

## CONCLUSION

- ▶ PHINS and GAPS are alternative sensors that would allow enhancing

- Integrity
- Availability
- Redundancy

of DP positioning reference systems