



DYNAV

Redundant dual mode positioning system

POWEX

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POWEX AS

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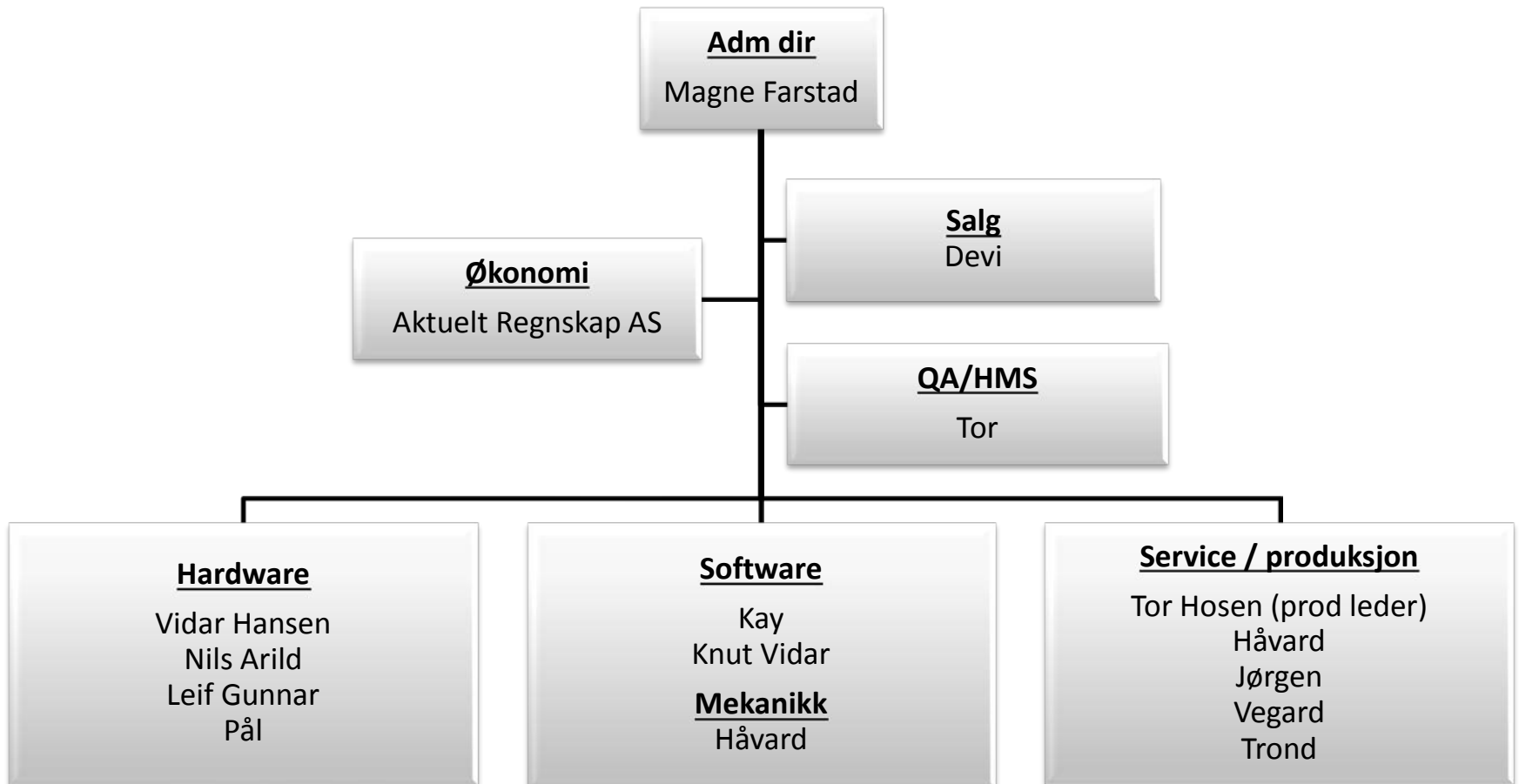
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office@powex.no

QA certificate

ISO 9001:2008





Product development

- Electronic design
- PCB layout
- Software embedded
- Hydraulic controls
- Mechanical design

Production

- Assembly
- Test
- Delivery

Transmit
Antenna

EUT

Immunity Level

System status

GNSS

UHF Link 1

CrcError	3	6	0	0
PosType	NARROW_INT	NARROW_INT	N/A	N/A
NorthSD	0.00548928	0.0104813	0	0
EastSD	0.00646624	0.00766911	0	0
Bearing	299.302	283.701	0	0
RFPower	500	500	0	0
Supply Voltage	26.75	26.48	0.0	0.0
SatInSol	13	14	0	0
Temp (deg. C)	41	41.5	0.0	0.0
Height	-36.8657	-36.0693	0	0

2.0.1

With selected:

Move Left

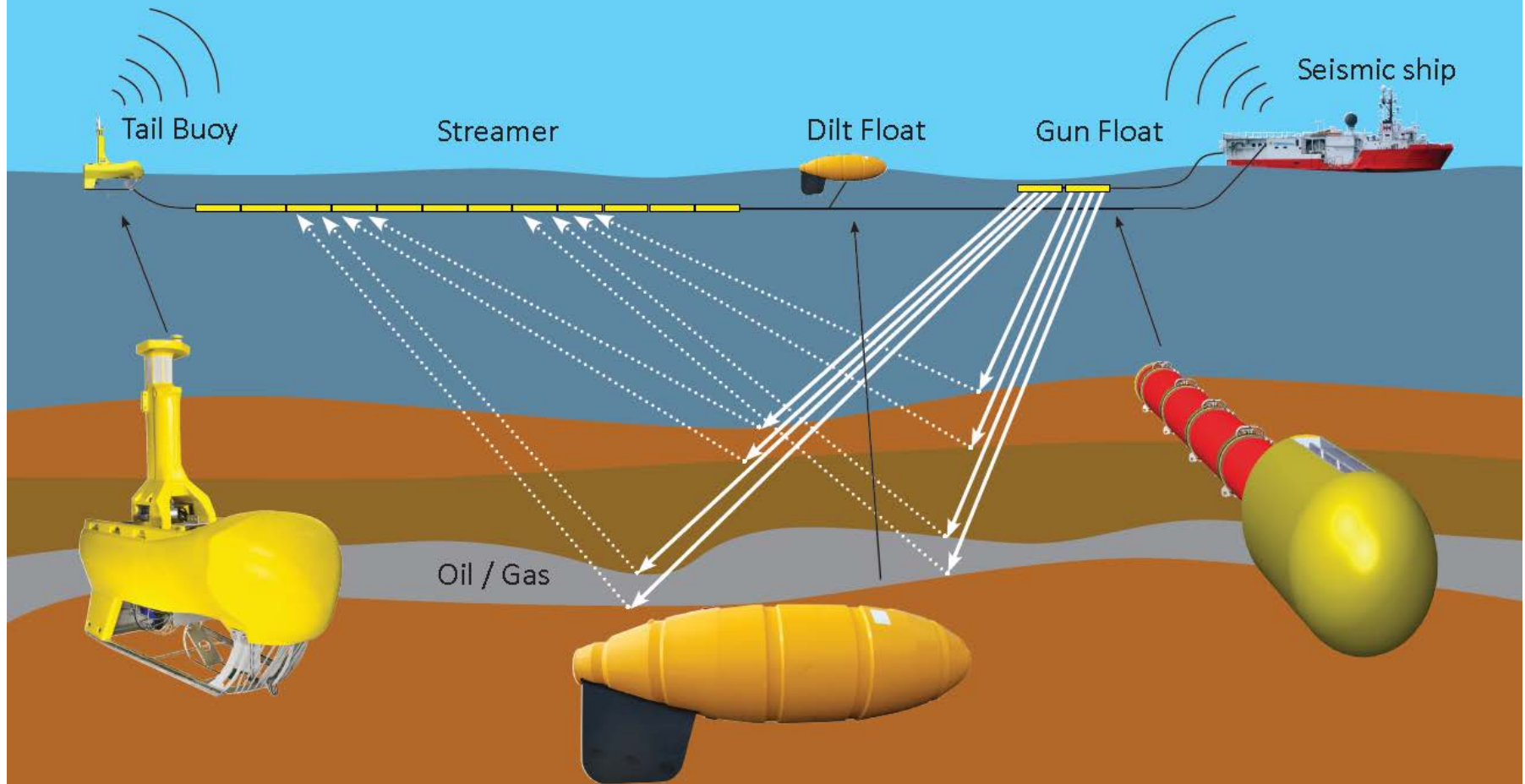
Move Right

Move to Link...

Clear Selection



Seismic towing solutions



Seismic positioning

ACCURATE POSITIONING = > IMPROVED SEISMIC DATA



Challenges in seismic positioning



Challenges in seismic positioning

- IN-SEA OPERATION
 - fast reacquisition after diving
 - multipath /reflections (GPS and radio)
- EXTREME ENVIRONMENTAL CONDITIONS
 - Shock – vibration (air-gun's)
 - Frequent launch – recovery => damages
 - Corrosion (splash zone equipment)
 - Temperature variations
- LARGE NUMBER OF NODES IN PARALLEL OPERATION
- DEMAND FOR FAST POSITION UPDATE RATES
- HIGH RELIABILITY REQUIREMENTS - LONG RUN's
- EXTENDED RADIO COMMUNICATION RANGE

SEISMIC SURVEY SURFACE COMPONENTS



Tailbuoy Equipment

- Solar panel



- Generator



DYNNAV



- Signal light
PWX LED



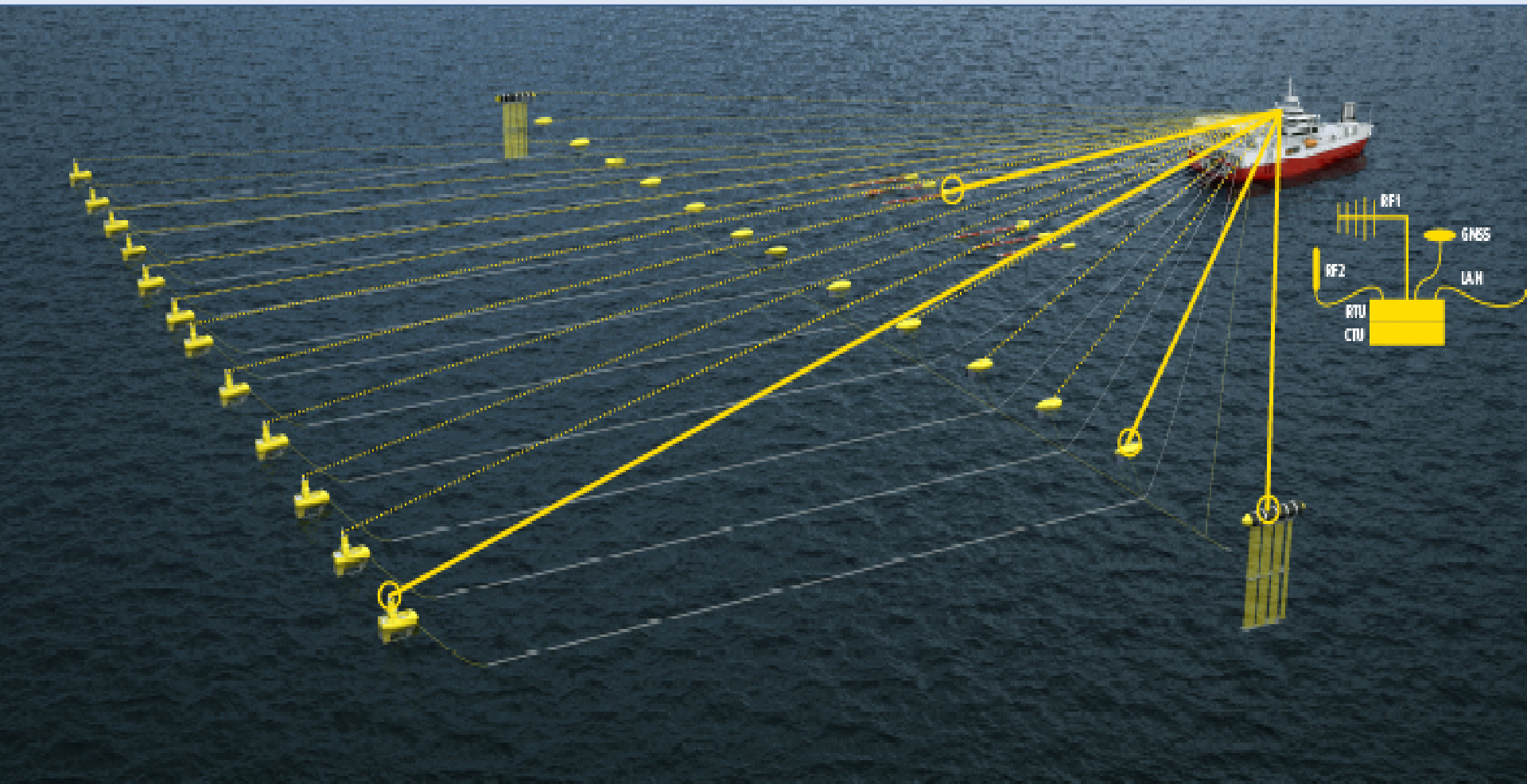
- ELBOX
- Battery

- Acoustics

DYNAV – GUN FLOAT INSTALLATION



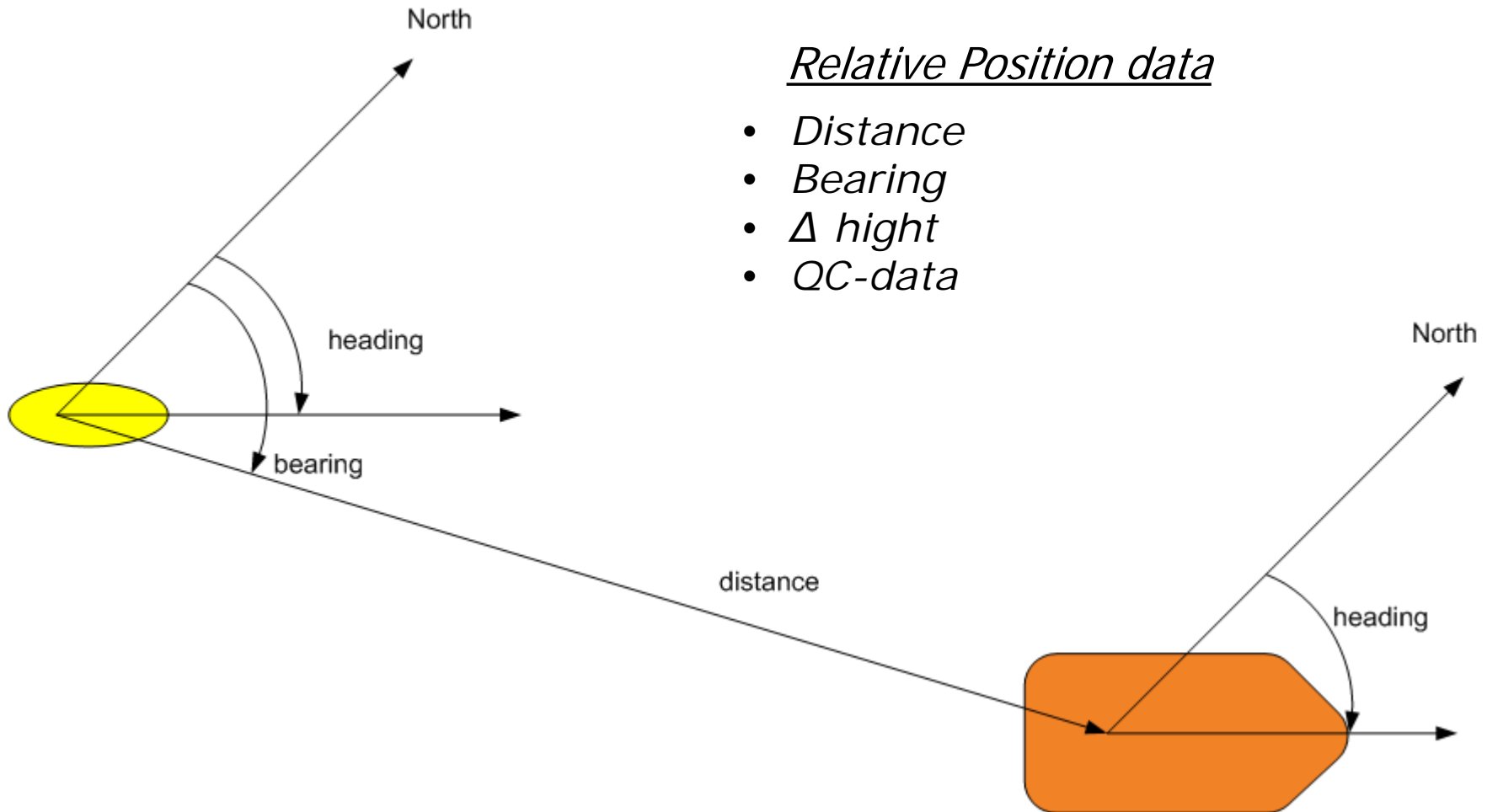
DYNAV **RELATIVE POSITIONING SYSTEM**



Dynav output

Relative Position data

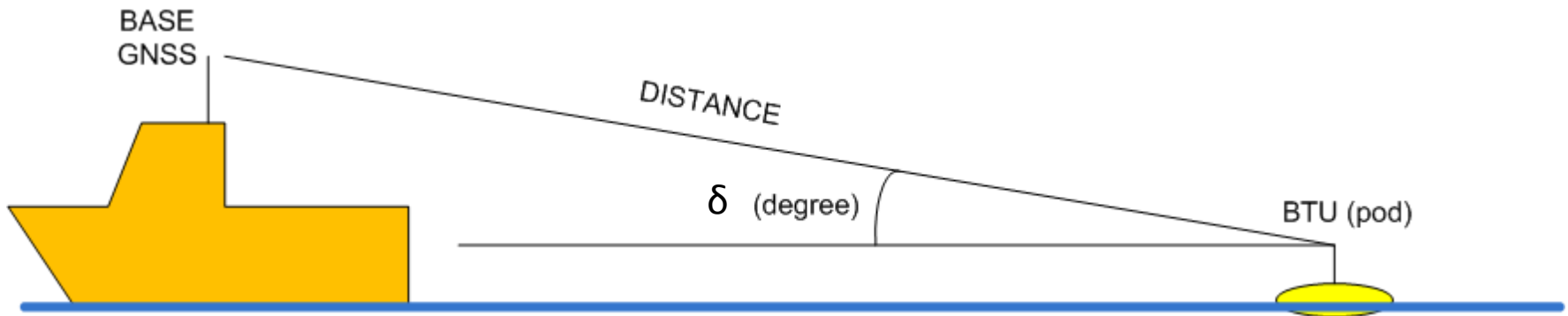
- *Distance*
- *Bearing*
- Δ *hight*
- *QC-data*



Dynav output

Relative Position data

- Distance
- Bearing
- Δ height
- QC-data





GLONASS and GPS satellites

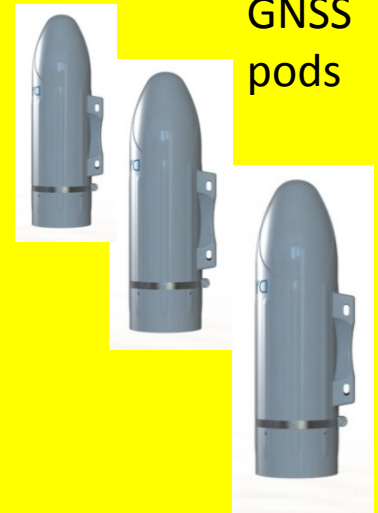
Dynav

Vessel installation



DYNAB Base Installation

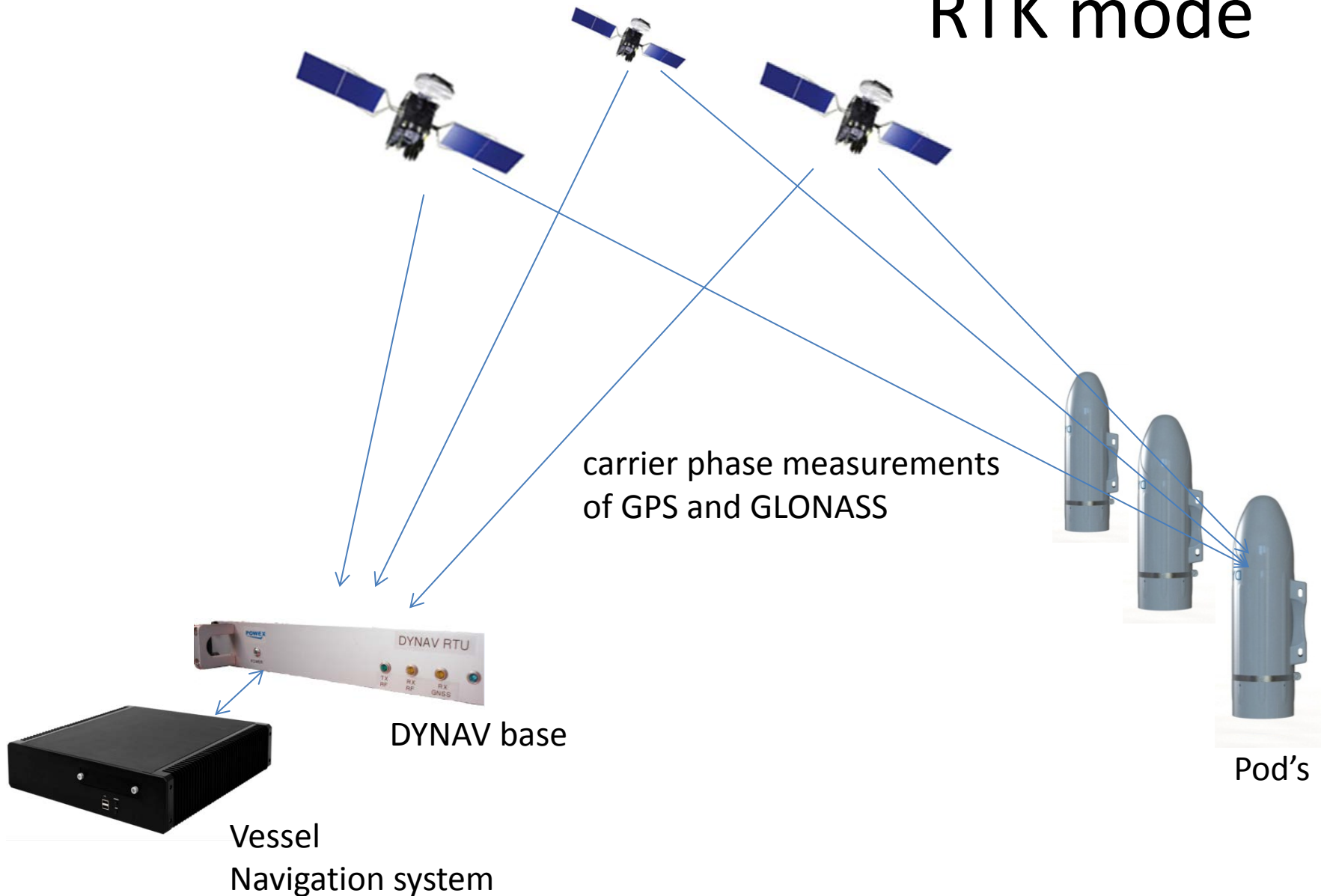
Vessel
Navigation system



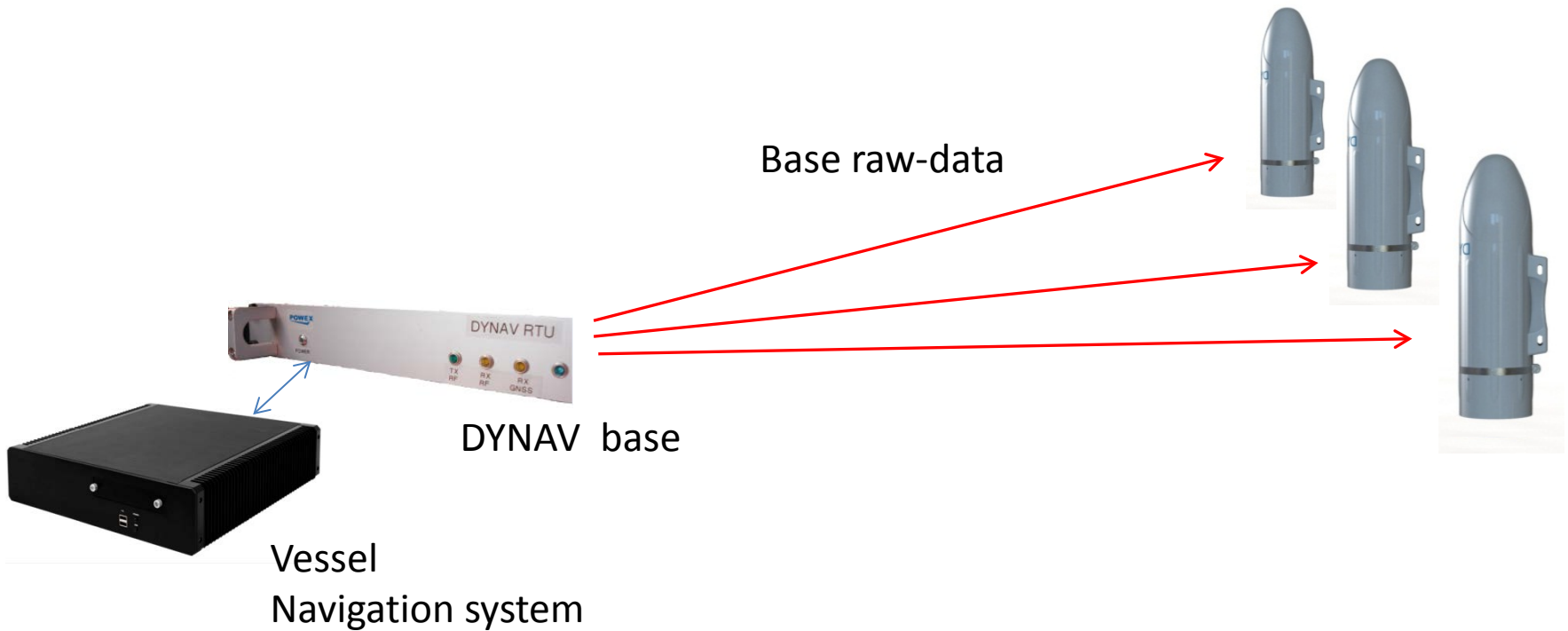
GNSS
pods

Buoy installation(s)

RTK mode



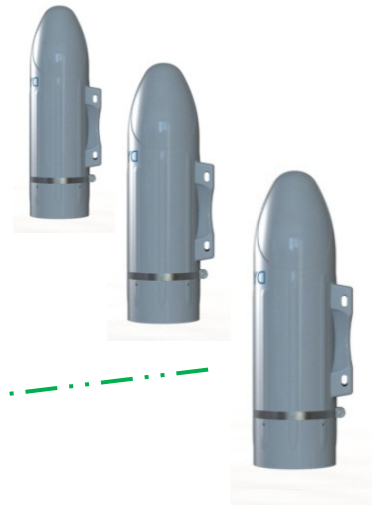
RTK mode



RTK mode



Bearing, distance, height, QC-data



DYNAP



Navigation system

Adding redundancy in Dynav

- Introducing two independant positioning principles (RTCM / RTK)
- RTCM does not require new correction data for each position calculation
- RTCM also enables better long-range performance due to a one-way TDMA based communication
- Adding repeater functionality

RTCM mode (fallback system)



Correction data



Absolute positioning system

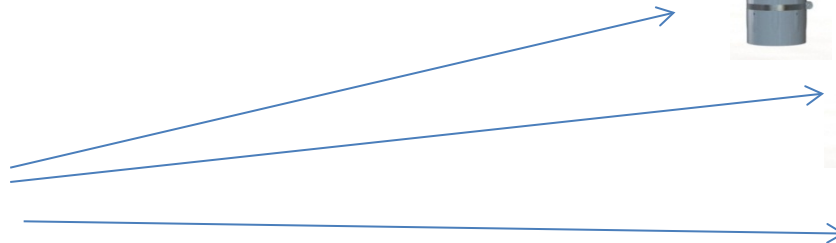
RTCM correction



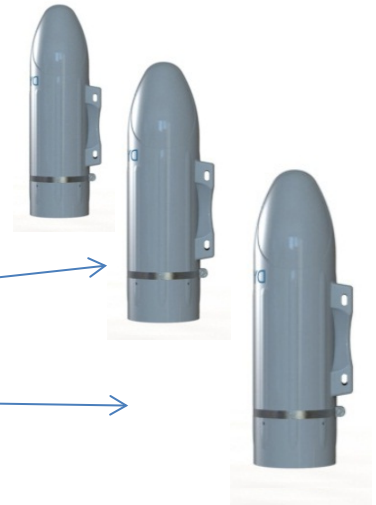
DYNNAV



Vessel
Navigation system

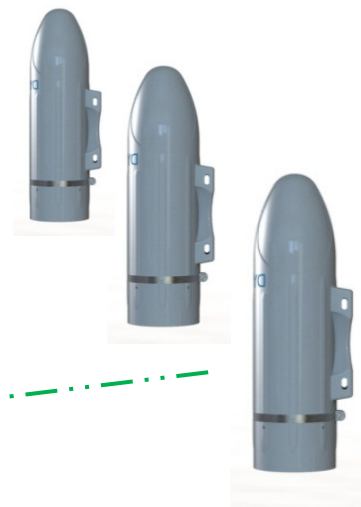


RTCM correction
broadcast





RTCM- mode



Position data



Relative position
calculations



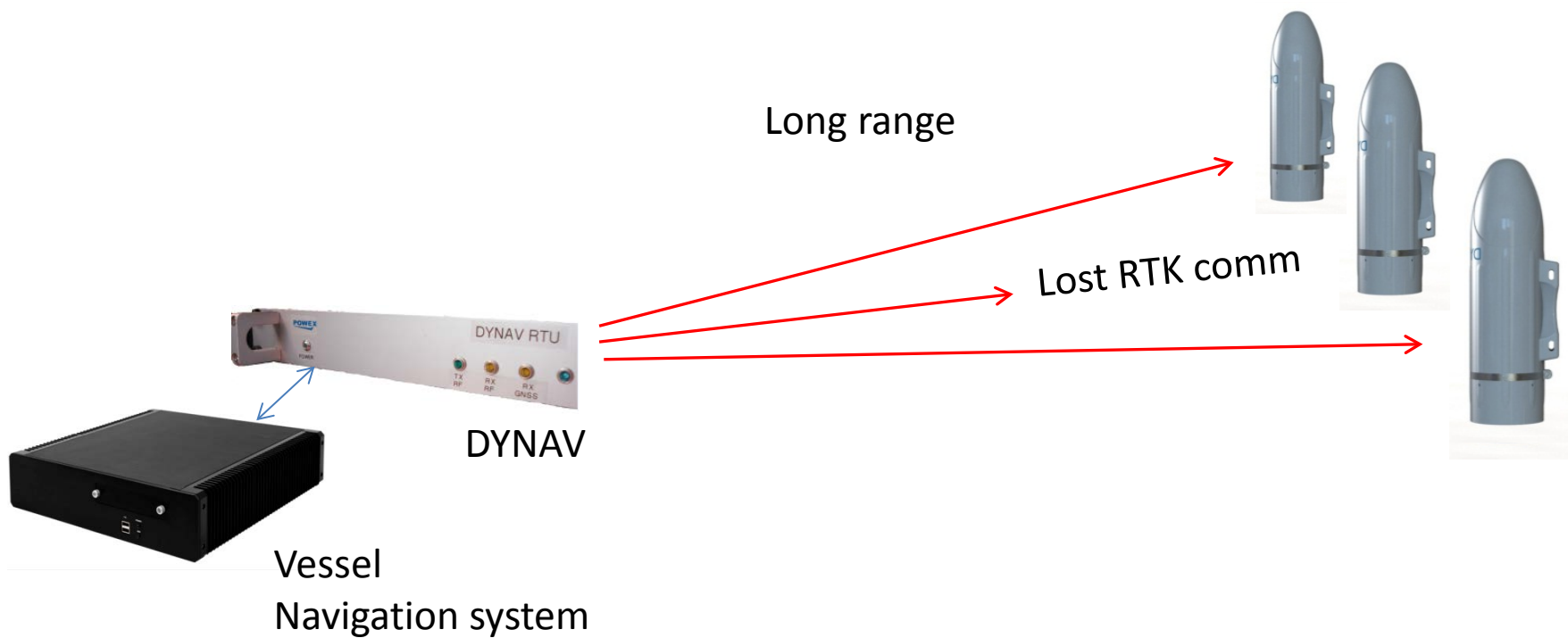
DYNNAV



Vessel
Navigation system

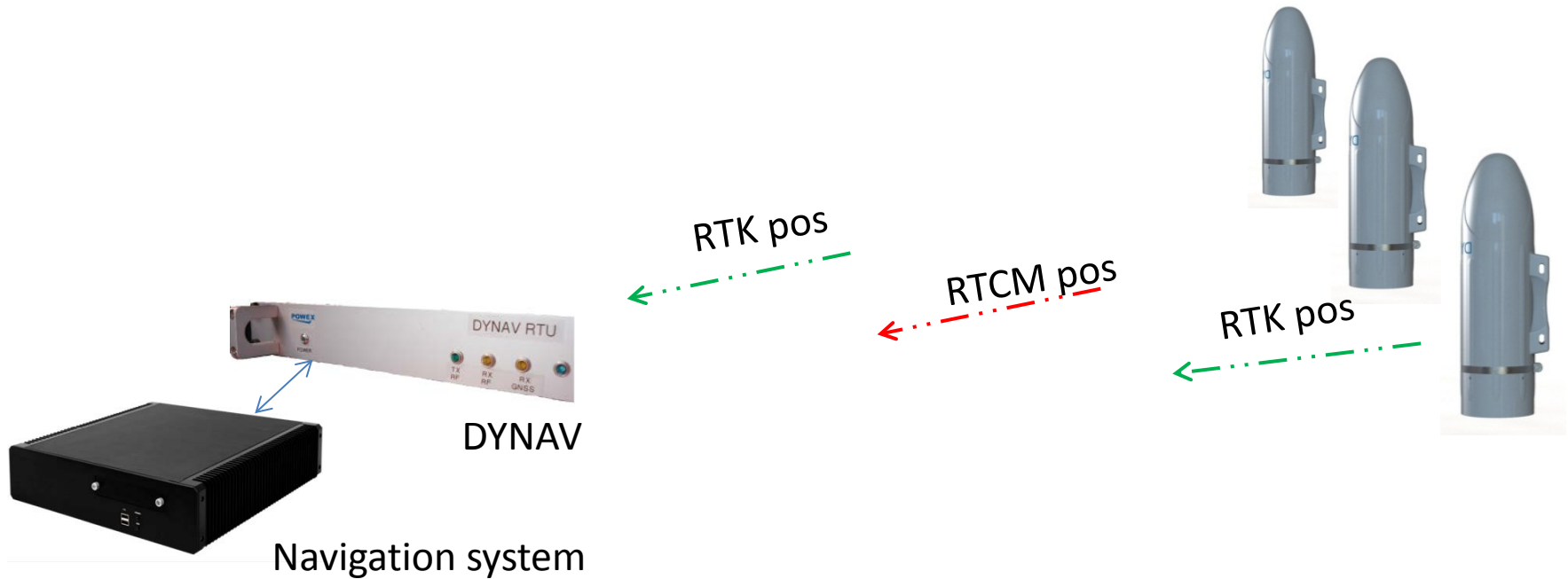


RTK – RTCM mode





RTK – RTCM mode

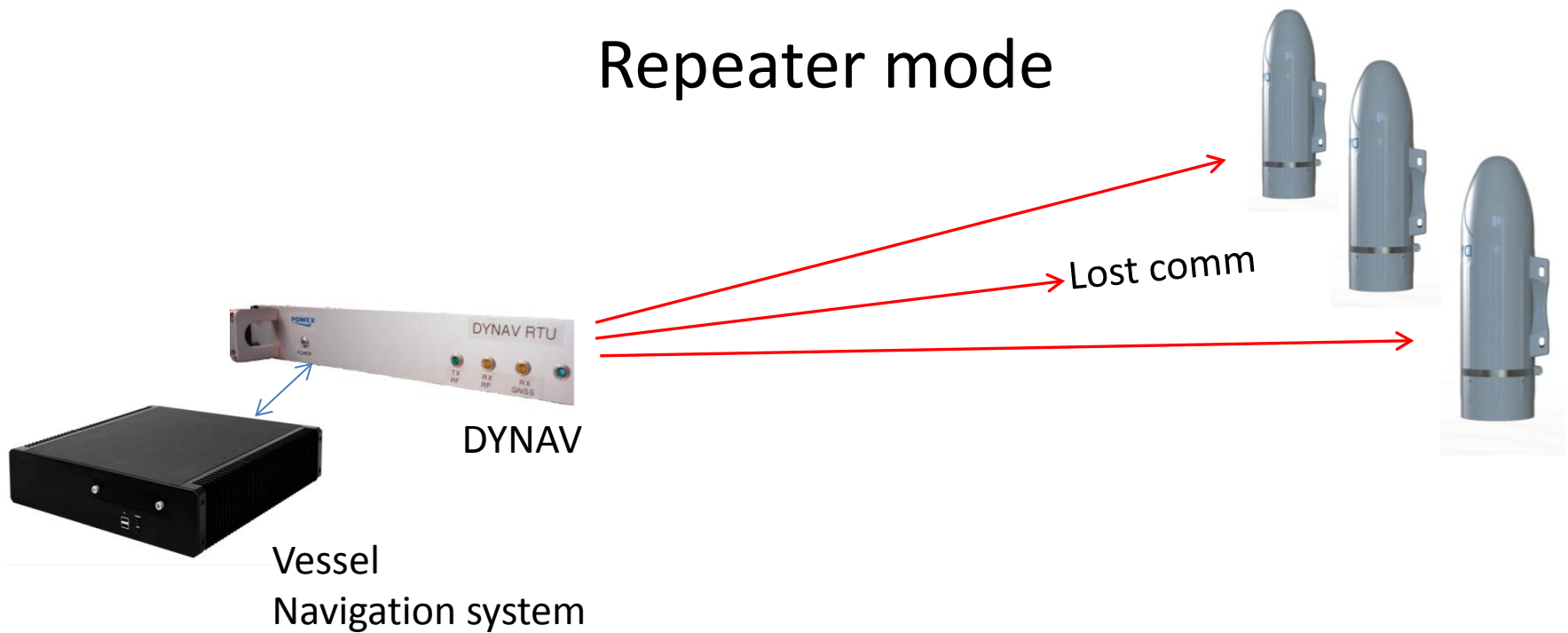


Why repeater functionality

- Increases long range performance
- Repeater on RTCM only ensure a «100%» fallback option

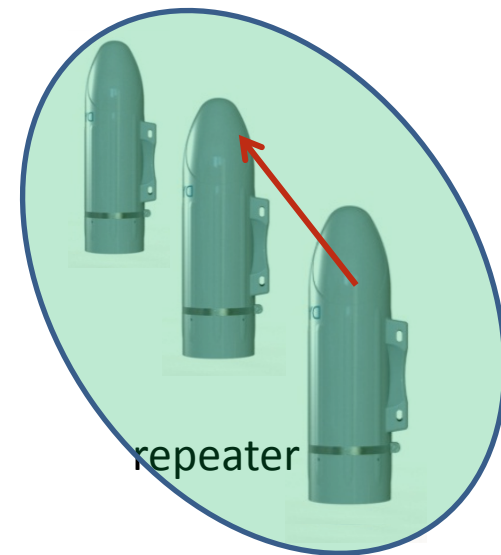
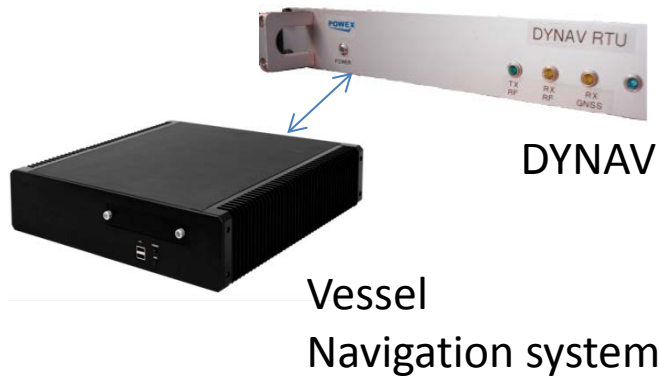


Repeater mode



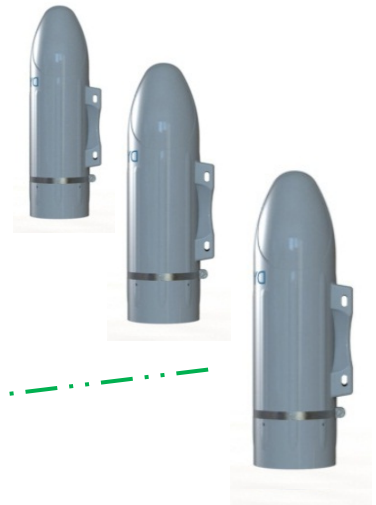


Repeater mode





Repeater mode



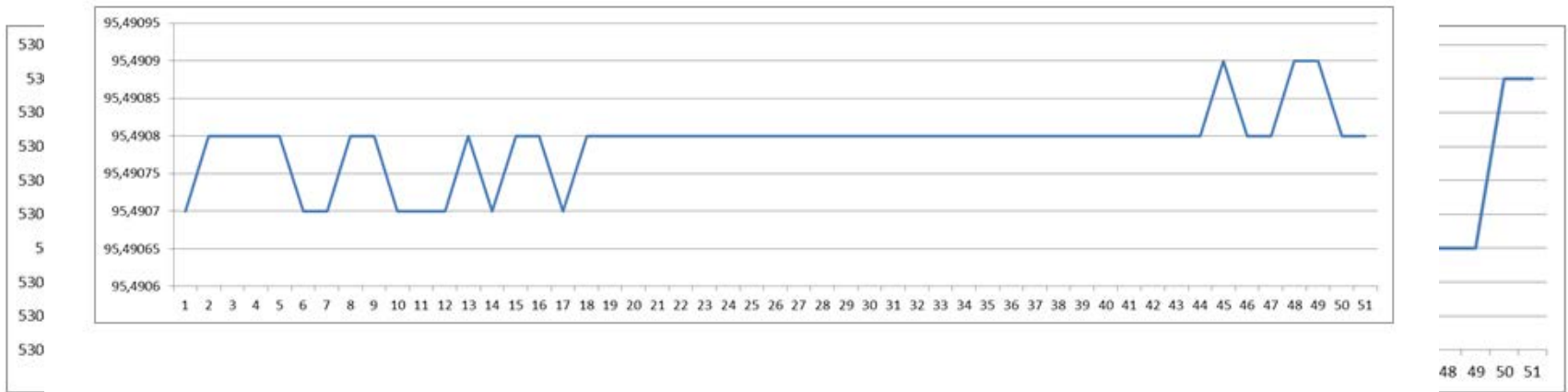
DYNAP



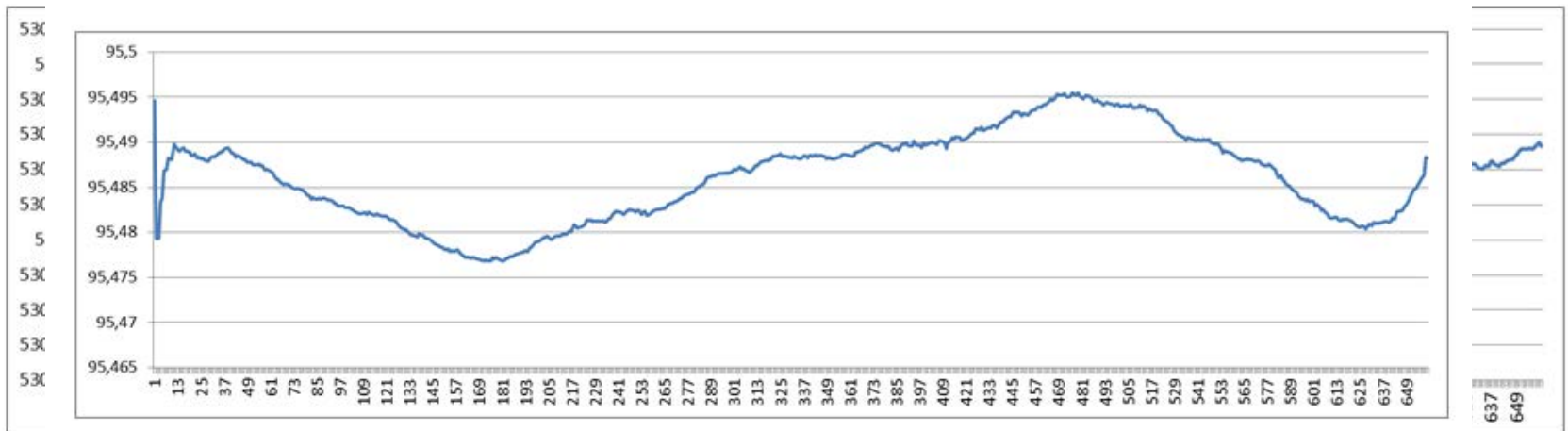
Navigation system

RTK vs RTCM accuracy (range 5300m)

HEADING RTK



HEADING RTCM



Static range / bearing measurements of existing systems

TB1

Median:	426,29	82,18				
St. Dev:	2,11	0,14				
Average:	426,34	82,18				
Min:	415,03	81,91				
Max:	437,39	82,54				
	Range	Bearing				

TB2

Median:	425,91	81,54				
St. Dev:	1,89	0,10				
Average:	425,85	81,54				
Min:	414,58	81,24				
Max:	438,79	81,81				
	Range	Bearing				

TB3

Median:	425,55	81,20				
St. Dev:	1,38	0,21				
Average:	425,54	81,24				
Min:	422,53	80,53				
Max:	437,28	81,95				
	Range	Bearing				

Dynav System performance

- Position update rates 0,5 – 4 sec
- Typically 100 BTU's (pod's) can be addressed in the system (can be increased)
- Up to 6 simultaneous radio channels in use
- Different update rates for different radio channels enables faster position updates for Source floats than for Tailbuoys.

Dynav - System capacity				
	Position update rates (max)			
Radio channels	1 sec	2 sec	3 sec	4 sec
1	8	18	28	38
2	16	36	56	76
3	24	54	84	114
4	32	72	112	
5	40	90		
6	48	108	Number of BTU pods	

Thank you !