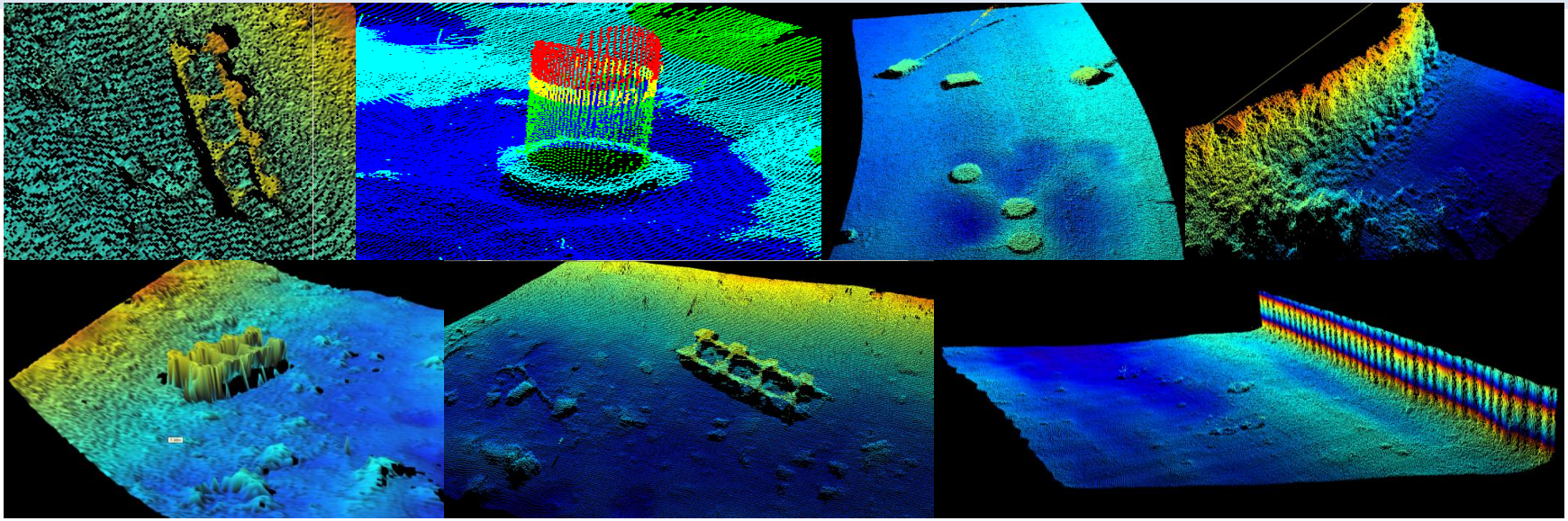
# OPTIMIZACIÓN DE TOMA DE DATOS BATIMETRICOS

# OPTIMITATION OF DATA ACQUISITION BATHYMETRIC SURVEYS

*XXXIII GEBCO, Valparaiso 12 Oct*



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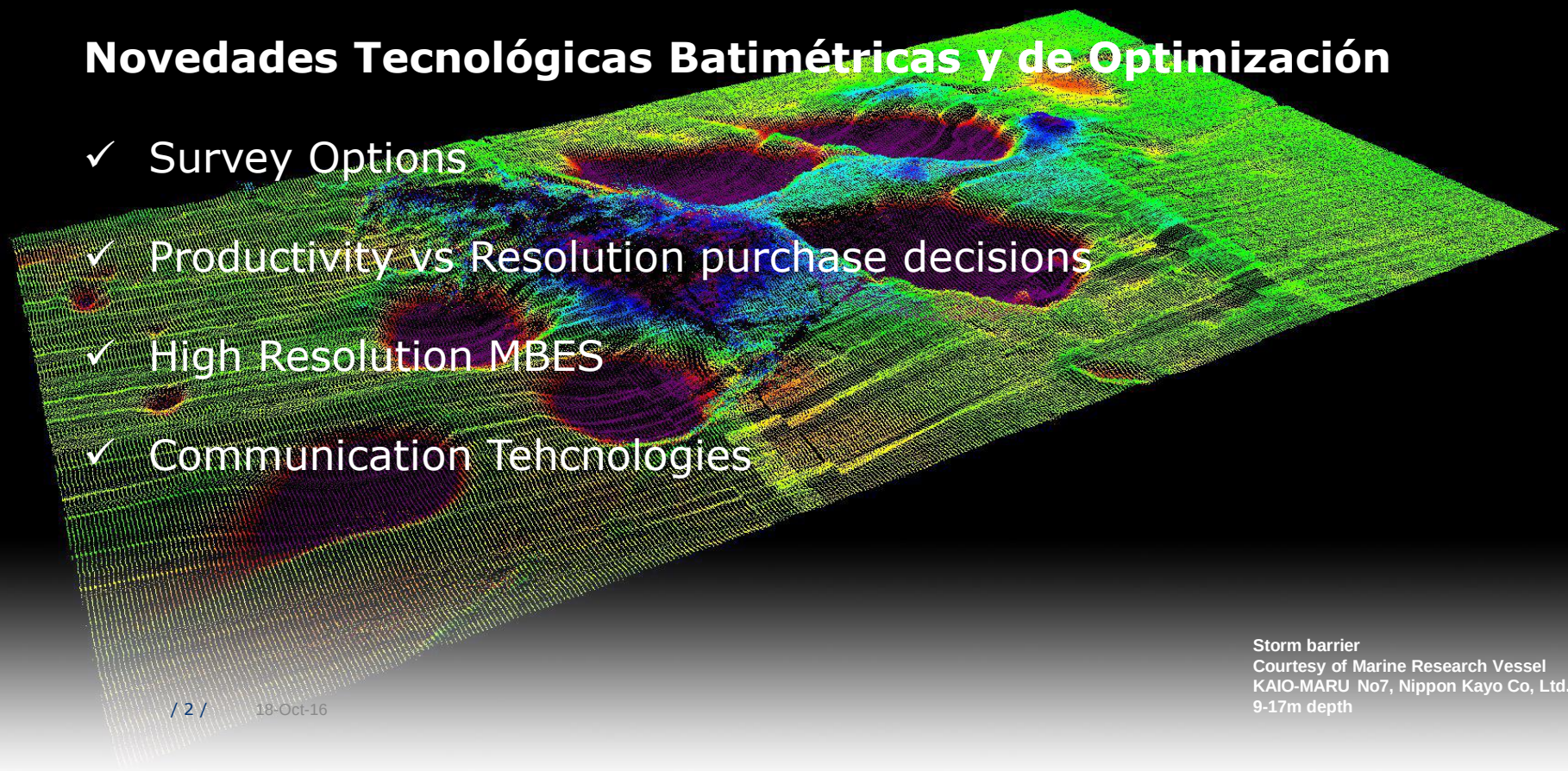
# AGENDA

## Novedades Tecnológicas Batimétricas y de Optimización

- ✓ Survey Options
- ✓ Productivity vs Resolution purchase decisions
- ✓ High Resolution MBES
- ✓ Communication Tehcnologies



Storm barrier
Courtesy of Marine Research Vessel
KAIO-MARU No7, Nippon Kayo Co, Ltd.
9-17m depth

# Products for any subsea applications

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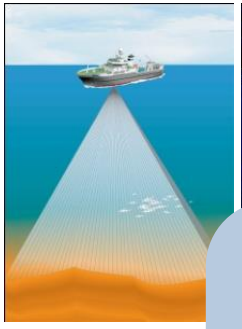
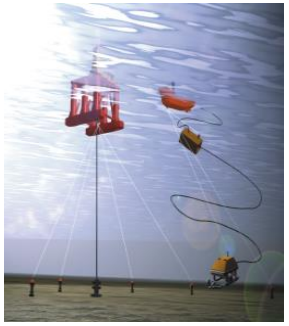
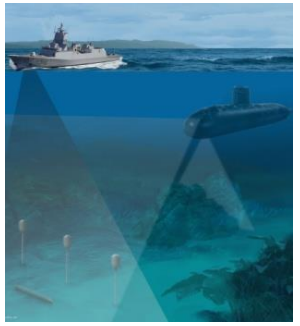
Surveillance | Fishery / Research | AUV | Seabed mapping | Under water navigation | Naval sonars

One third of the world
Is covered by land –

The rest is covered by
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…just a small taste of a variety of products

# Underwater Mapping

## Hydroacoustic Survey Solutions for all Applications and Environments

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### Technology

- Bathymetry
  - Single Beam
  - Multibeam
- Side Scan Sonar
  - Towed
  - Hull mounted
- Sub-Bottom Profilers
  - CW/FM/Parametric
  - 2D/3D

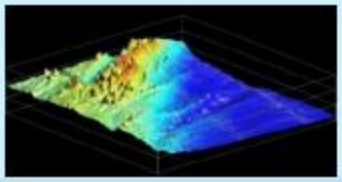
### Environment/Platform

- Shallow waters
- Medium waters
- Deep waters
- AUVs
- ROVs
- ROTVs

### Applications

- Hydrographic Survey
- Inspection
- Dredging
- Exploration
- Research
- Naval

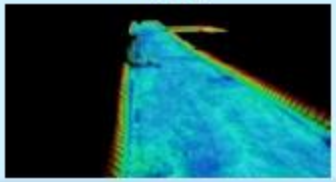
Habitat mapping



Operation Support Dredging

Offshore Renewable Energy

Port and Harbour Surveying



ROV & AUV applications

## Hydrographic Applications and products

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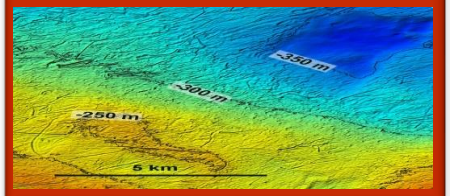
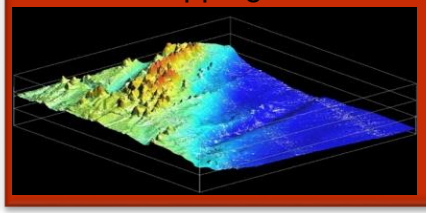
### Marine Geology



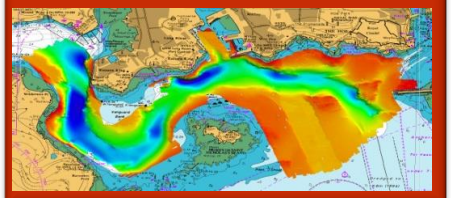

### Scientific research Habitat mapping



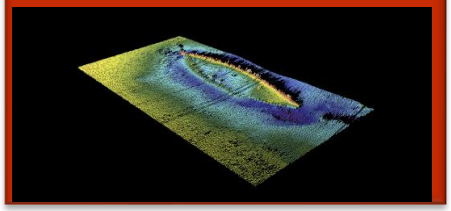
### Exclusive Economic Zones mapping (EEZ)

### Detailed Mapping (ROV, AUV applications

### Nautical charting



### Archaeology

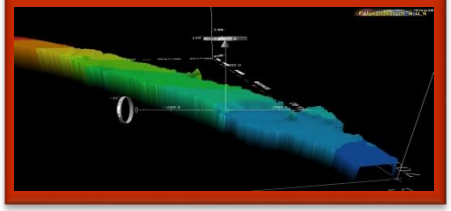


- Single Beam Echo Sounders
- Multibeam Echo Sounders
- Side-scan sonars
- Sub Bottom Profilers
- Services

### Operation Support Cable Laying

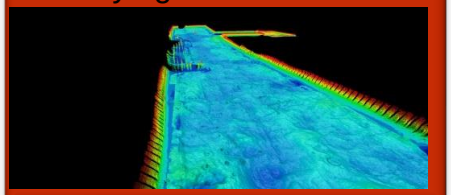
### Offshore Renewable Energy

### Route Surveying

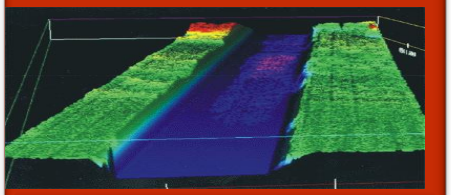


### Operation Support: Dredging

### Port and Harbour Surveying



### Mapping of Rivers and Canals



# Multibeam Systems

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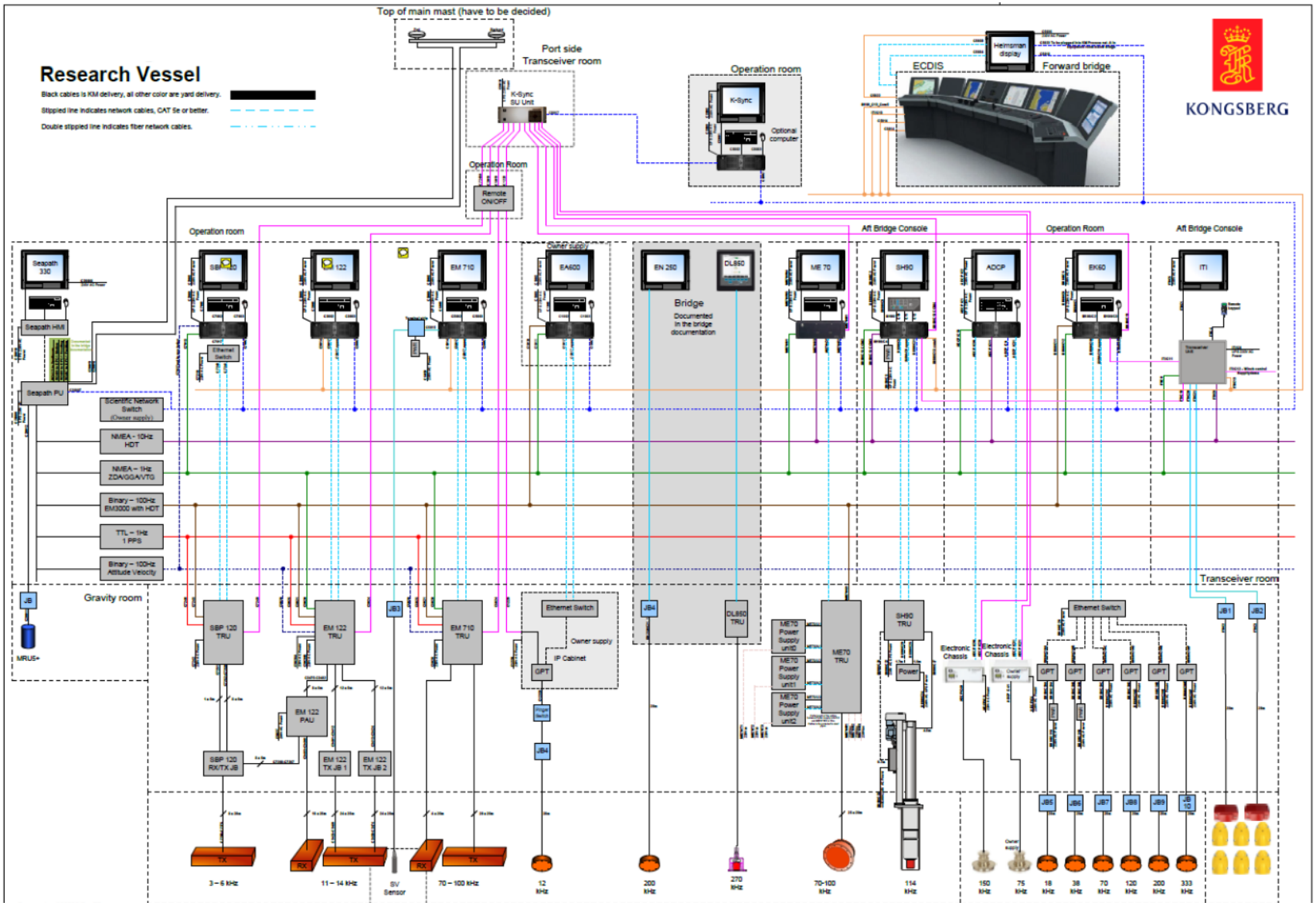
# Integration



# Sondadores Multihaces

## Tamaño de transductor vs Frecuencia/Ancho de Haz

EM® 712 (2 x 2)
~0.5m x 0.5m

40 – 100 kHz

Alcance 3m – 3600m

EM® 302 (1 x 2)
~3m x 1,7m


30 kHz

Alcance 10m – 7000m

EM® 122 (1 x 1)
~8m x 7m

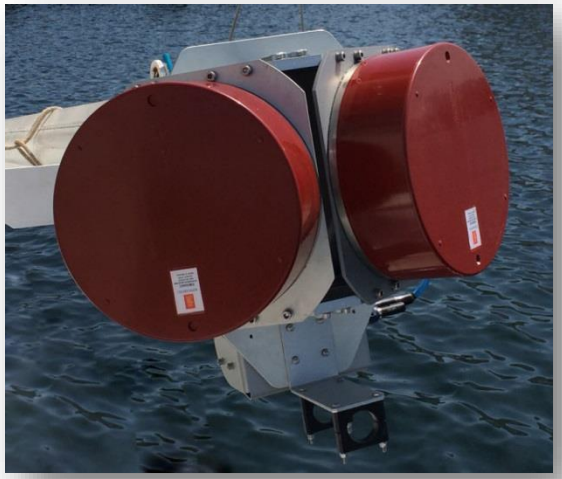
12 kHz

Alcance 20m – full ocean depth

# Sondadores Multihaces

## Tamaño de transductor vs Frecuencia/Ancho de Haz

EM® 2040C (1 x 1)
Ø 300mm



200 – 400 kHz

Alcance 0,5m – 500m

EM® 2040P (1 x 1)
560 x 300 x 166 mm

200 – 400 kHz

Alcance 0,5m – 550m

EM® 2040-04 (0,4 x 0,7)
727 x 142 x 150mm

200 – 400 kHz

Alcance 0,5m – 600m

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# Bathymetry

## EM® 712

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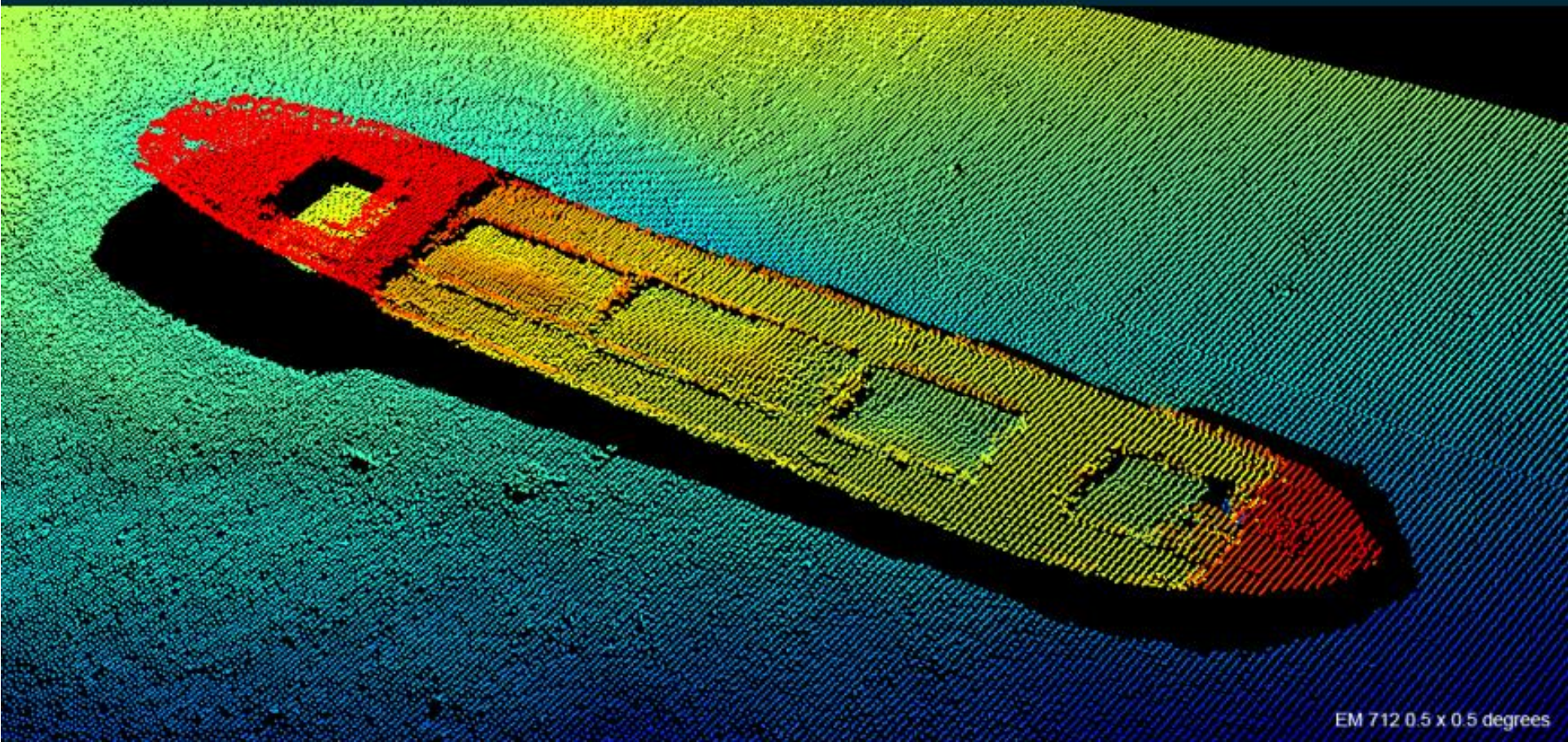

# EM 712 Results from Simrad Echo

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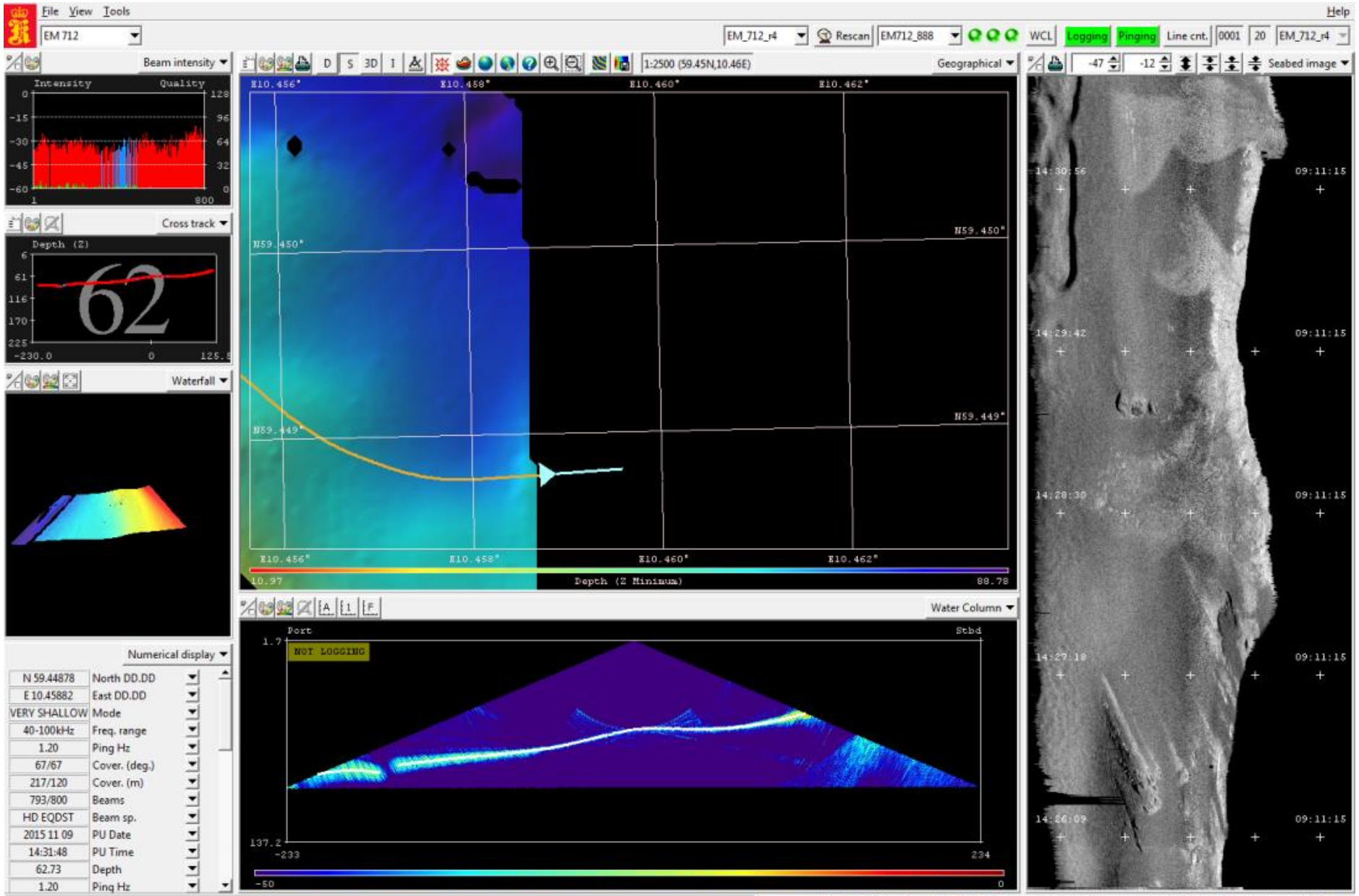

# Water column courtesy of IHPT
# - detection of objects in the watercolumn

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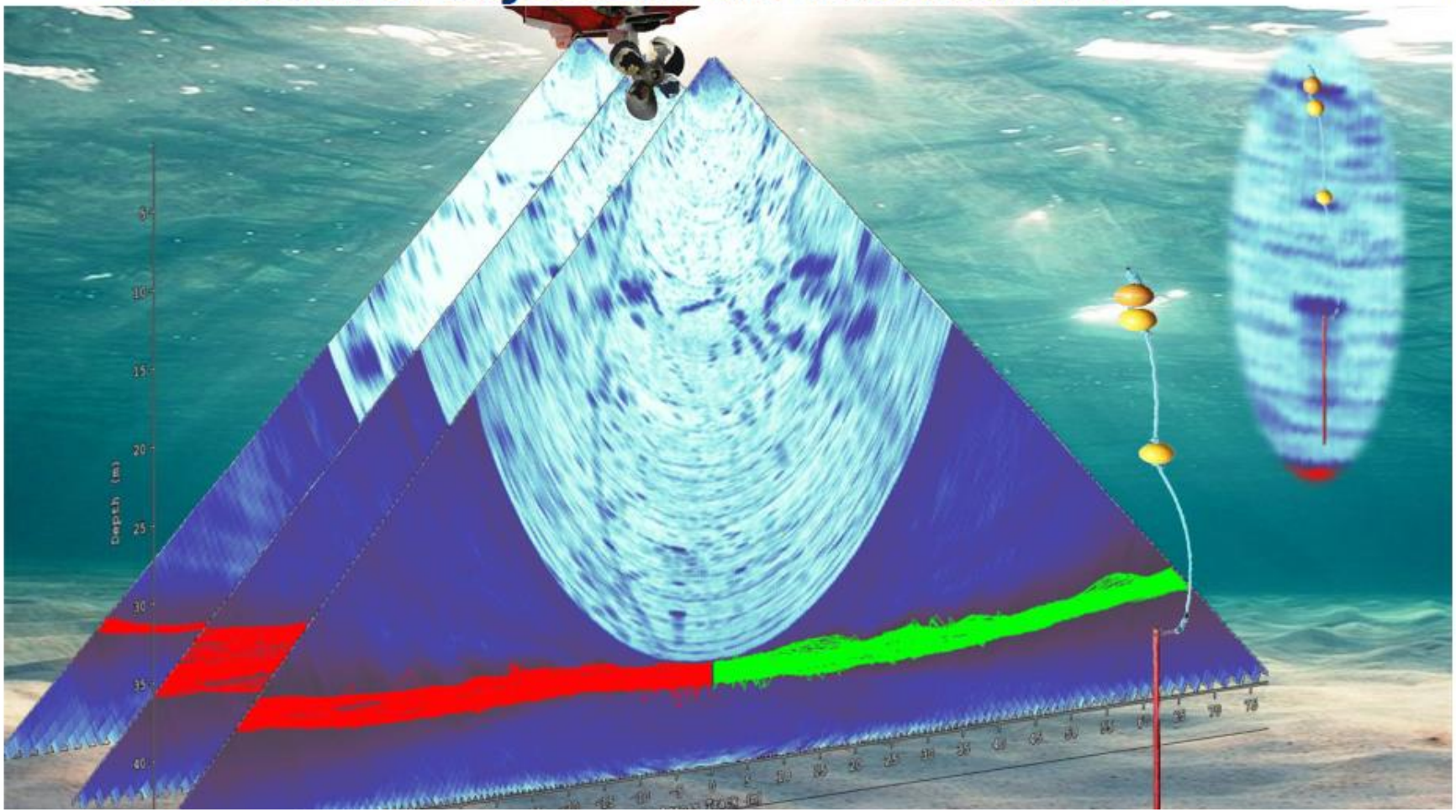

# EM 712 Results from Simrad Echo

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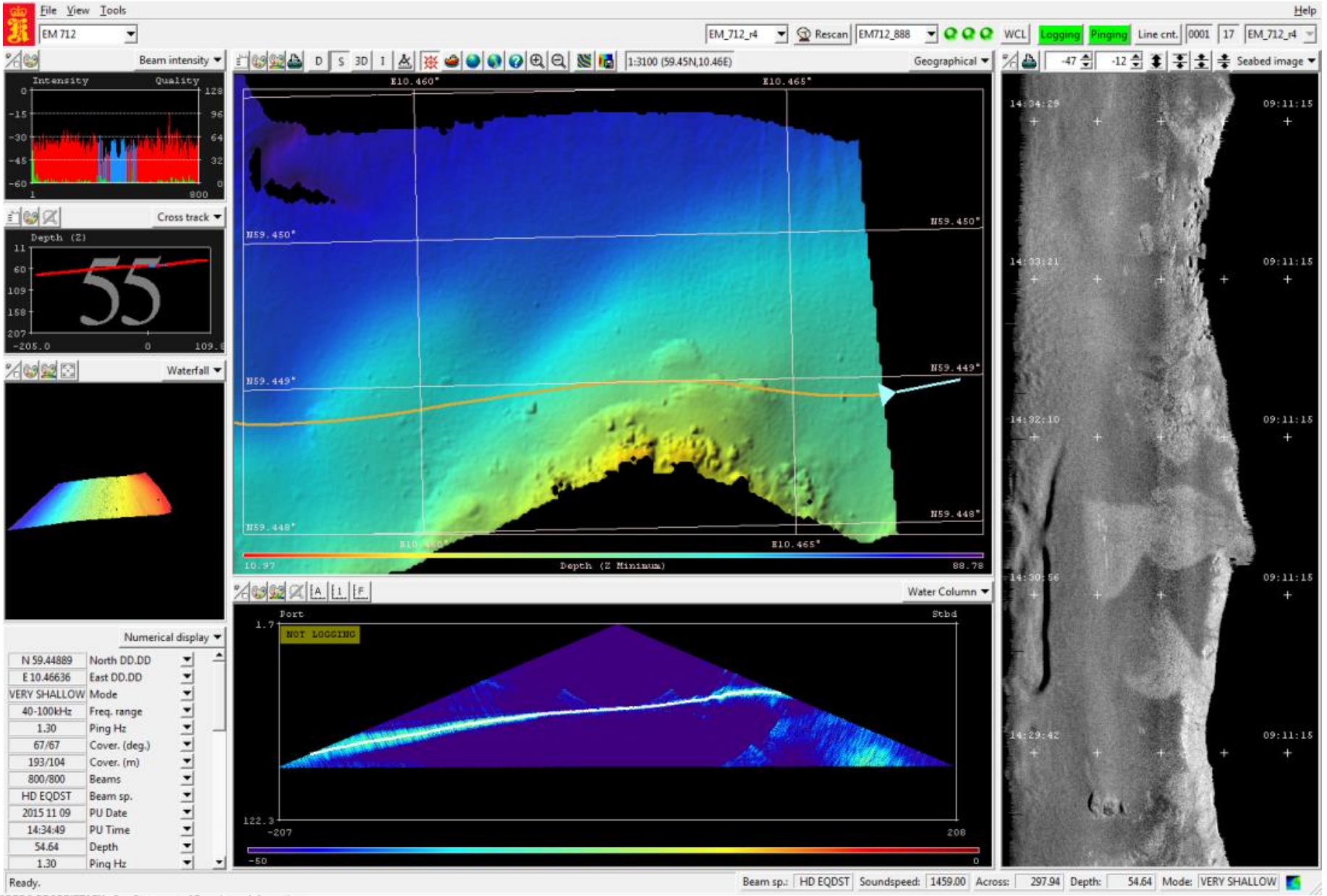
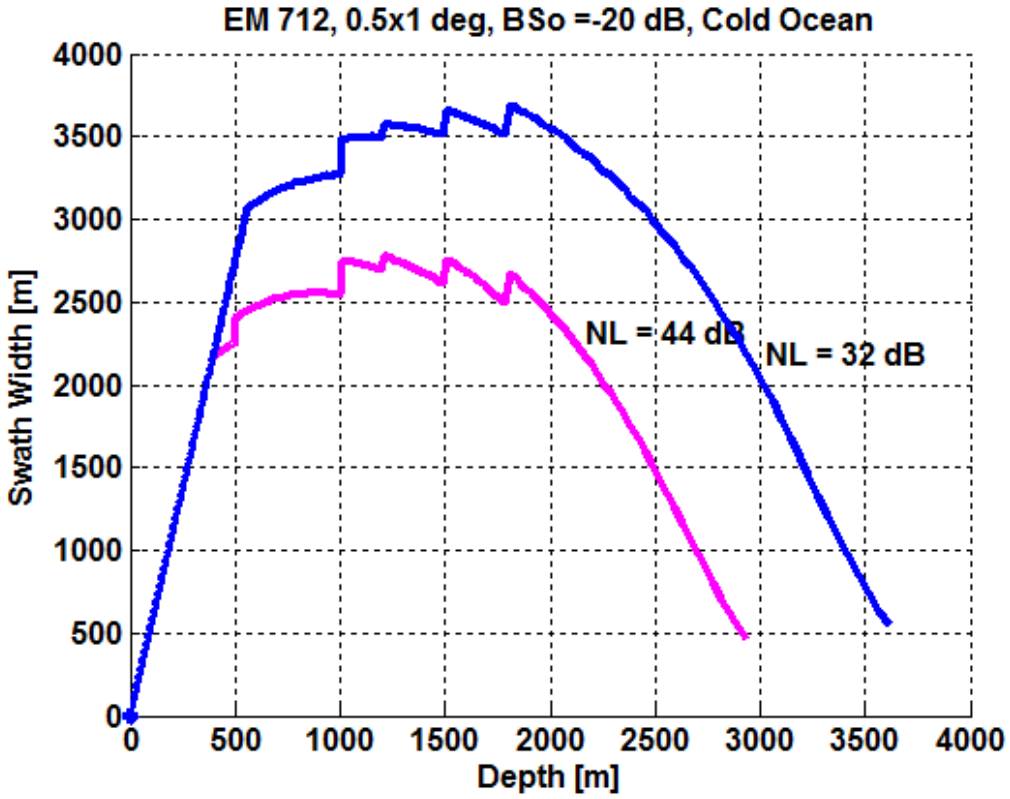
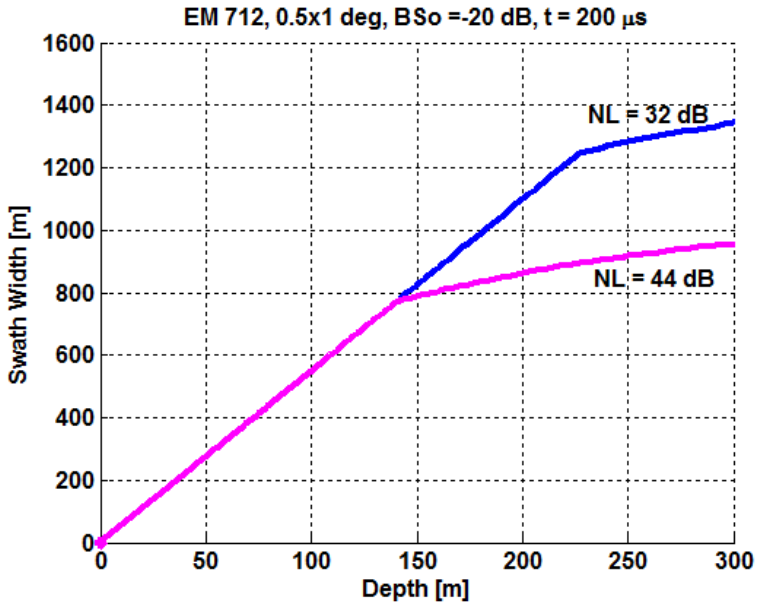


# Gama de Sistemas UMAP
## Desde sondas de aguas someras hasta las más profundas

| Sistema | Frecuencia | Profun. | Características y modos de instalación |
|---|---|---|---|
| **MULTIHACES** | | | |
| GeoSwath Plus | 125/250/500 kHz | 0.5 – 200m | Aguas muy someras Gran Barrido / Montaje Casco, Proa, ROV/AUV |
| EM® 2040C | 200 – 400 kHz | 0.5 – 500m | Muy Alta Resolución, / Montaje Casco, Proa, retractatil/retractable/in gondola |
| EM® 2040P | 200 – 400 kHz | 0.5 – 550m | |
| EM® 2040 | 200 – 400 kHz | 0.5 – 600m | Very high resolution, portable/hull mount/bow/retractable/in gondola |
| EM® 712 | 40 – 100 kHz | 3 – 3600m | Very high resolution, hull mount/bow/ROV/AUV/retractable/in gondola |
| EM® 302 | 30 kHz | 10 – 7000m | Very high resolution, hull mount/retractable/gondola |
| EM® 122 | 12 kHz | 20 – 11000m | High resolution, hull mount/in gondola |
| | | | High resolution, hull mount/in gondola |
| **MONOHACES** | | | |
| EA 440/EA 440SP | 30 – 500 kHz | 0.5 – 3000m | Buques de oportunidad, estanca, Montaje en casco o por proa |
| EA MCU | 200 kHz | 0.5 – 10m | Aguas Muy Someras, Gran Barrido, montaje en casco |
| EA 640 | 10 – 500 kHz | 11000m | Montaje en Casco o en Gondola |
| **SBL** | | | |
| EA Barrido Lateral | 200/500 kHz | 200m | Montaje en casco o en proa |
| 2094 Digital | 114/410 kHz | 250m | Remolcado / Buque de ocasión |
| **SONARES SAS** | | | |
| HiSAS 1032 | 100 kHz | 300m | AUV (1000m, 3000m and 4500m), ROTV (A comprobarse) |
| **PERFILADORES DE FONDO** | | | |
| SBP 120 | 2.5 – 7.5 kHz | 200m | Profundidad Total. Montaje en casco/en casco. Comparte RX con EM® 122 |
| SBP 300 | 2.5 – 7.5 kHz | 200m | |
| TOPAS PS 18 | 0.5 – 6 kHz | 200m | Profundidad Total. Montaje en casco/en casco. Comparte RX con EM® 302 |
| TOPAS PS 40 | 1 – 10 kHz | 60m | |
| TOPAS PS 120 | 2 – 20 kHz | 30m | Full ocean depth, parametric system. Hull mount/in gondola. |
| GeoPulse Plus | 1.5 – 13 kHz | 30m | Medium water (2000m), parametric system. Hull mount/in gondola. |
| | | | Shallow water (500m), parametric system. Hull mount/in gondola. |

# EM 712
# Noise Reduction → Coverage increasing



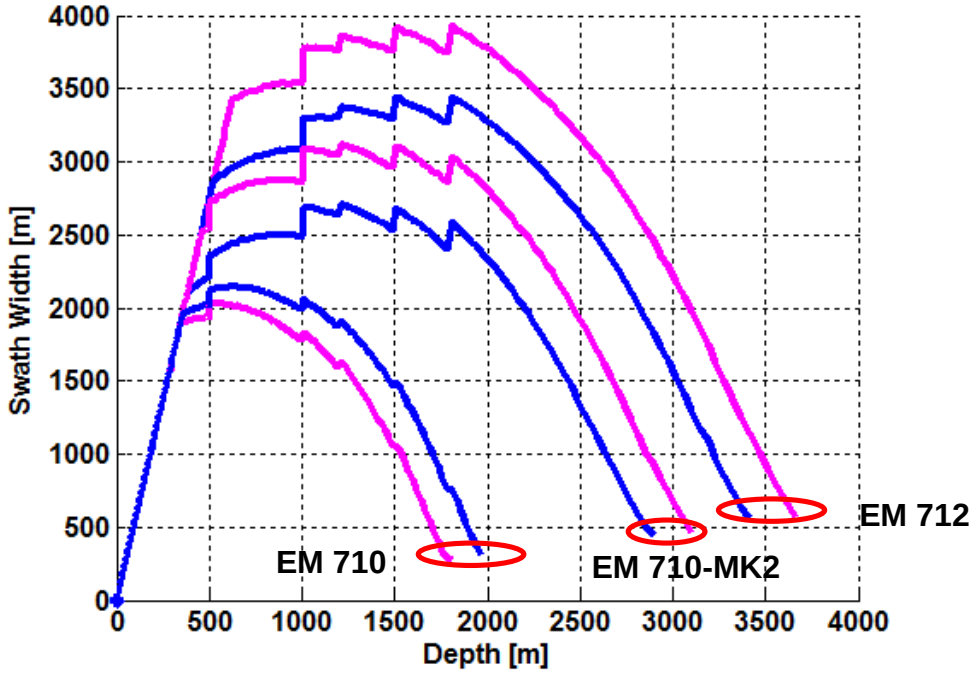
# EM 710, EM 710-MK2 y EM 712
# Comparativa coberturas

- Sistema 0.5º * 1º

- Magenta – Verano
- Azul – Invierno

- NL= 45 dB para EM 710 y EM 710-MK2

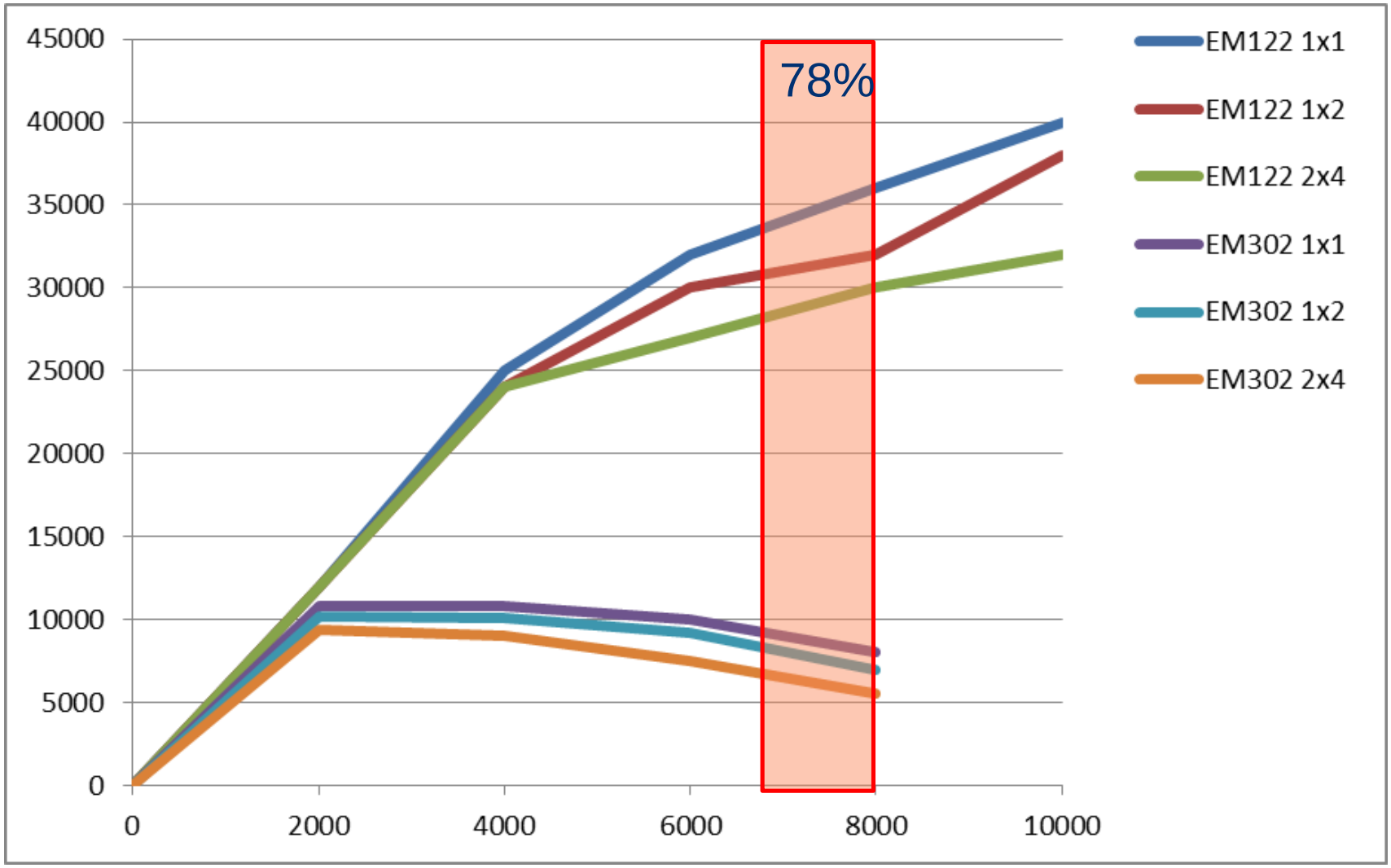
- NL= 35 dB para EM 712



# Productividad

- Profundidad de trabajo >70 % de Actividad
- Cobertura de los diferentes modelos
- Solape entre líneas
- Diferencia de precios entre modelos
- Estimación de calculos de operación del buque
- Conclusión de detrminación del sistema óptimo condierando el ahorro en costes operativos

# EM122 vs EM302 cobertura



# EM 122 cobertura

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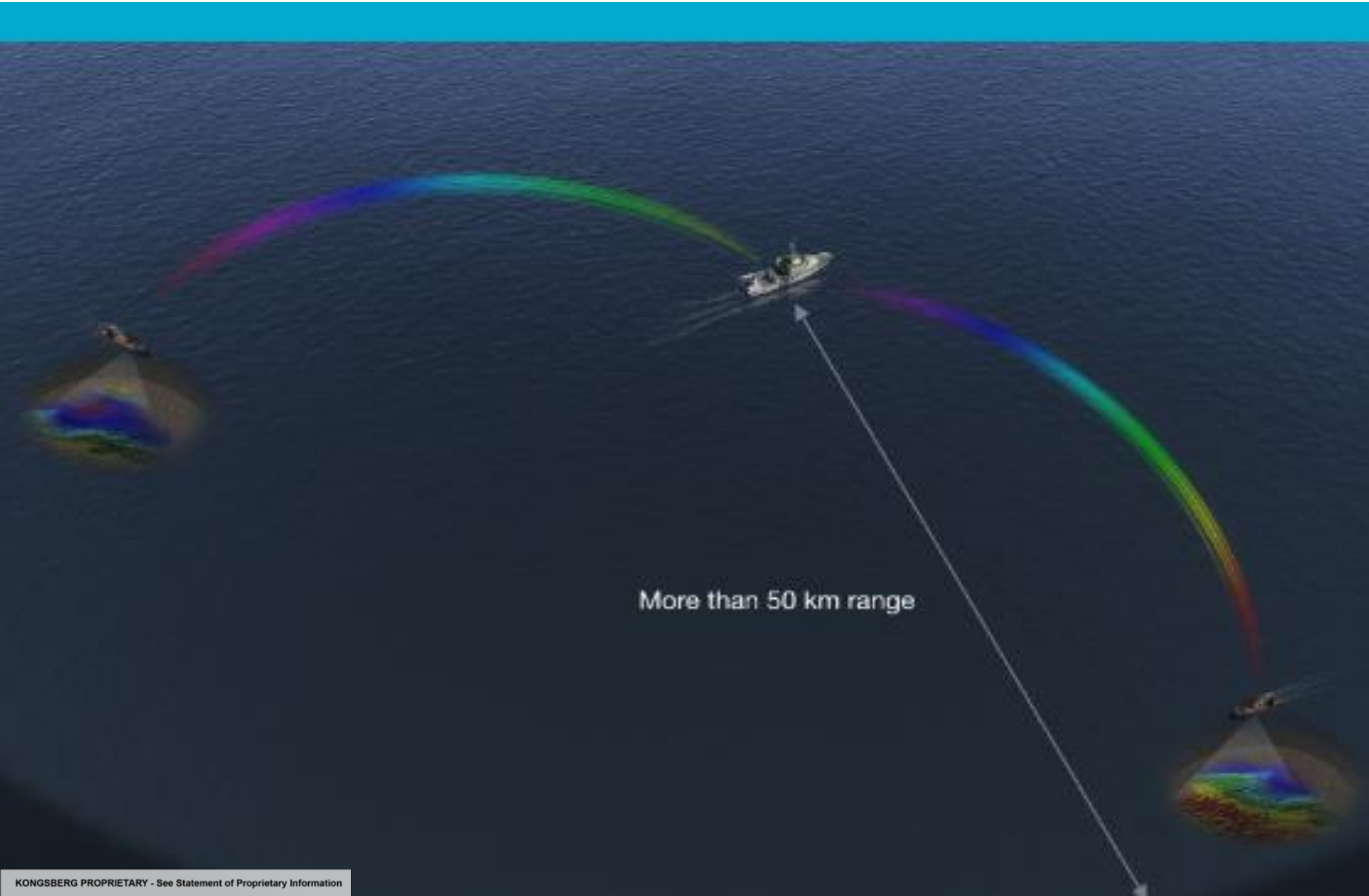
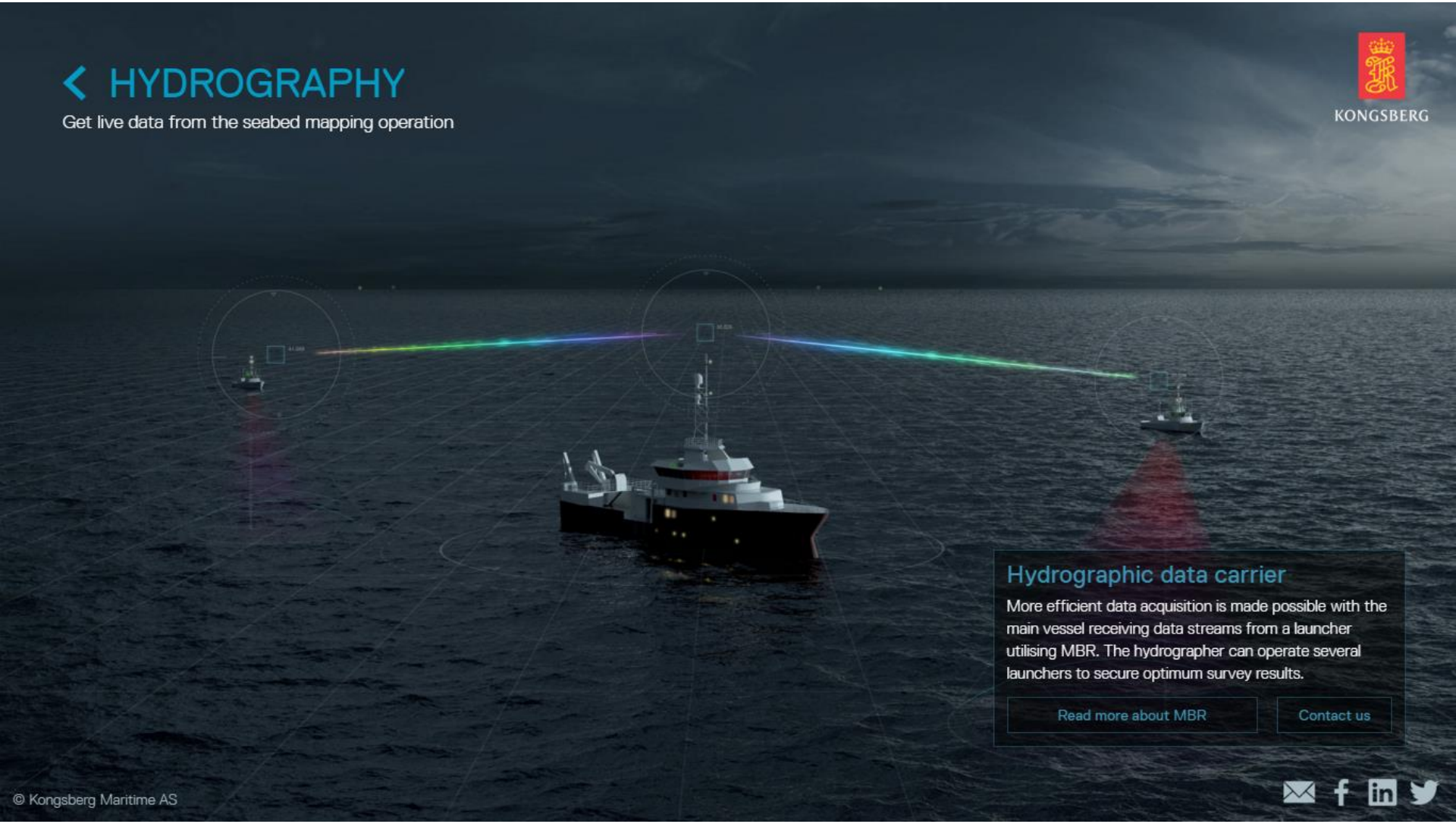
| | EM302 | EM122 | EM302 | EM122 | EM302 | EM122 | EM302 | EM122 |
|---|---|---|---|---|---|---|---|---|
| | Crosstrack coverage | Crosstrack coverage | 4 knots | 4 knots | 24 hours | 24 hours | 45 days | 45 days |
| | In meters | In meters | KM2/h | KM2/h | KM2/day | KM2/day | KM2 total | KM2 total |
| | 1x1 | 1x1 | 1x1 | 1x1 | 1x1 | 1x1 | 1x1 | 1x1 |
| **2000** | 10800,00 | 12000,00 | 80,01 | 88,90 | 1920,15 | 2133,50 | 86406,91 | 96007,68 |
| **4000** | 10800,00 | 25000,00 | 80,01 | 185,20 | 1920,15 | 4444,80 | 86406,91 | 200016,00 |
| **6000** | 10000,00 | 32000,00 | 74,08 | 237,06 | 1777,92 | 5689,34 | 80006,40 | 256020,48 |
| **8000** | 8000,00 | 36000,00 | 59,26 | 266,69 | 1422,34 | 6400,51 | 64005,12 | 288023,04 |

Para una configuración de EM122 1x1 cubre 288,023 km2 en este mismo tiempo la EM302 1x1 solo cubre 64,005 km2. Para que la EM302 cubra 288,023 km se requiren 202 dias de campaña esto supone 157 días extra.

# Radio de Banda Ancha MBR



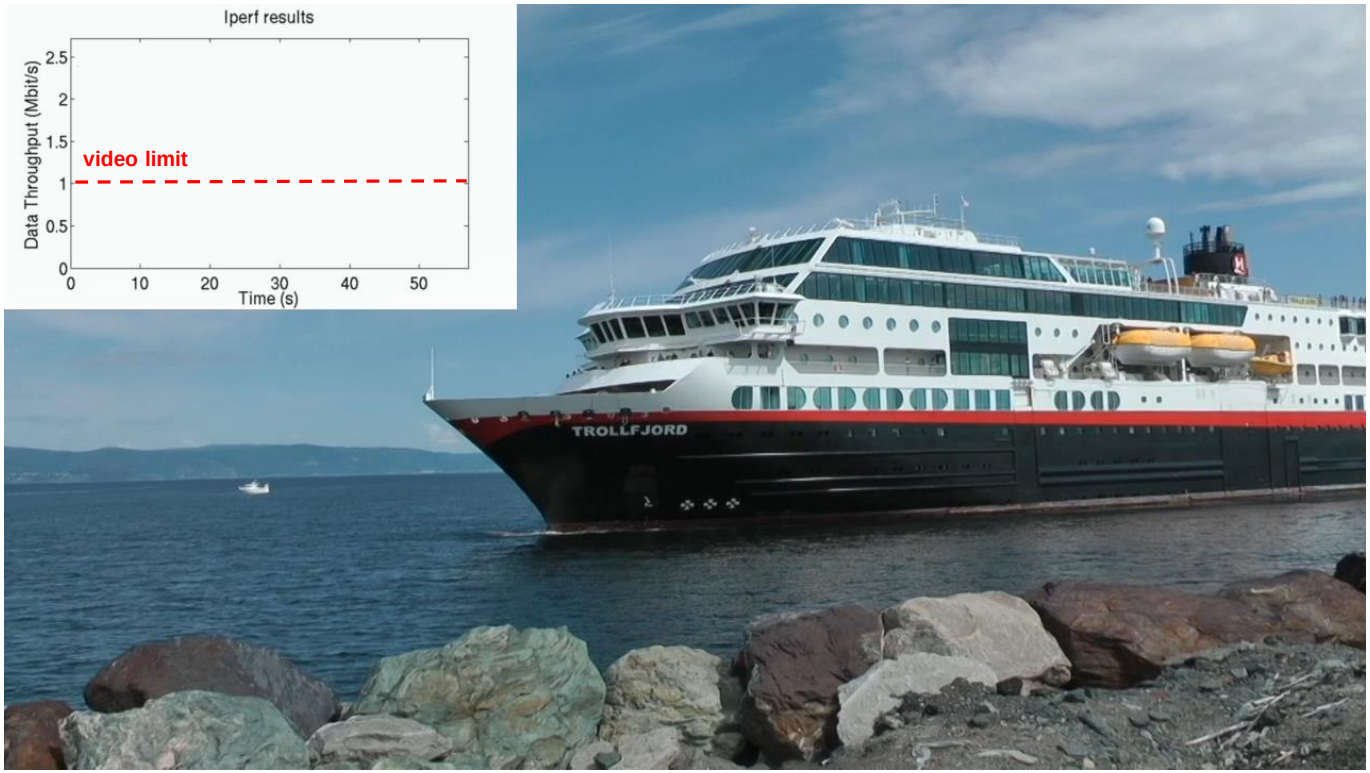
# Radio de Banda Ancha MBR



# Prueba de obstaculos

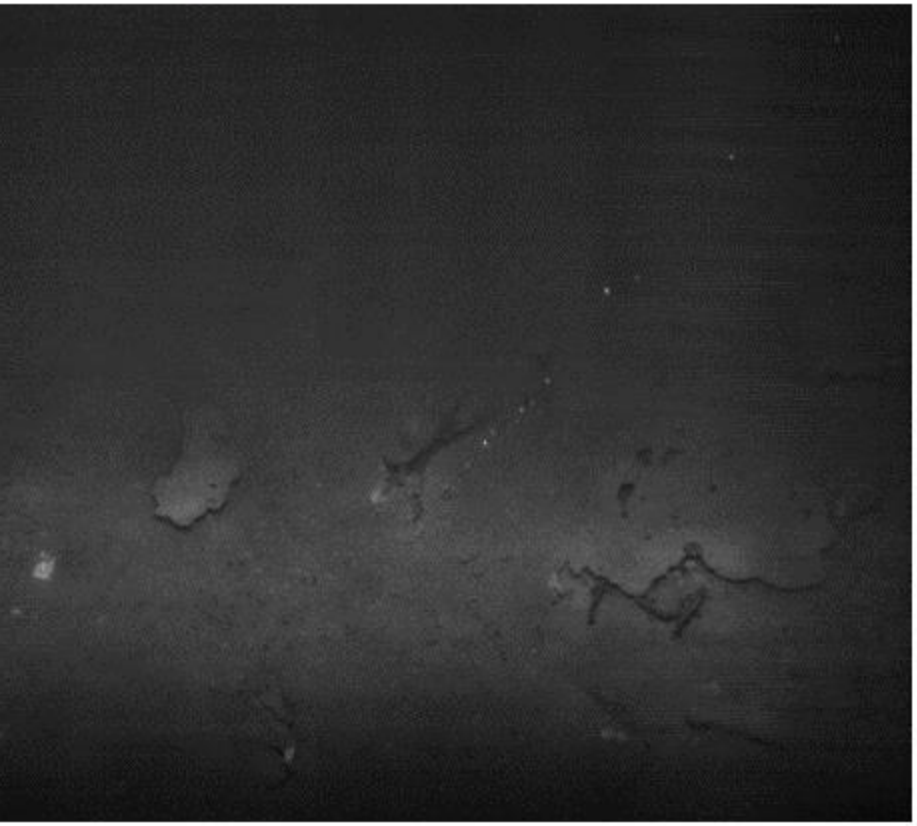
**2 Mbps**

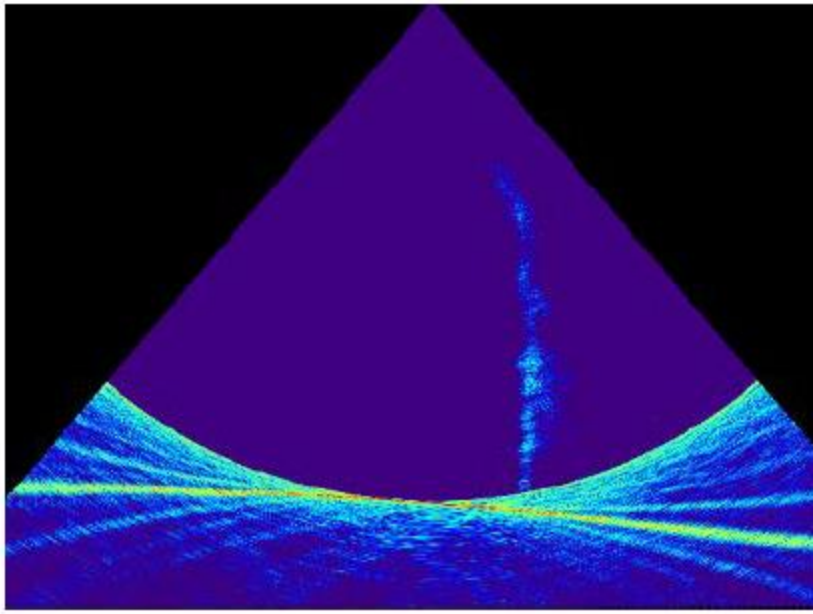
**1 Mbps**



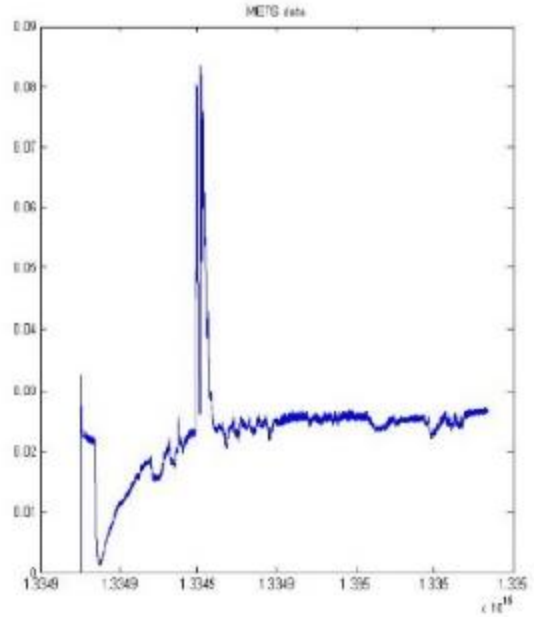
# ıge Detection

1. Acoustic leakage detection
   - Multibeam echo sounder
   - SSS or SAS
2. Hydro carbon sniffer
3. Digital still camera





Leakage detection with EM 2040




Hydro carbon sensor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SUBSEA MONITORING
WE DETECT TO PROTECT
$CO_2$
$CH_4$

# Gracias


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