

QUANTUM SENSORS FOR NAVAL DEFENCE INDUSTRY

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WHICH SPECIFIC ACTIVITIES OF NAVAL GROUP ARE CONCERNED BY QUANTUM SENSORS?

CONCEPTION OF THE GENERAL ARCHITECTURE



Shape

Sensors positions

Signatures

Field of view
Compatibility

General arrangement

Compliance with requirements

Mass repartition
Installation units constraints

Norm compliance
Qualification process

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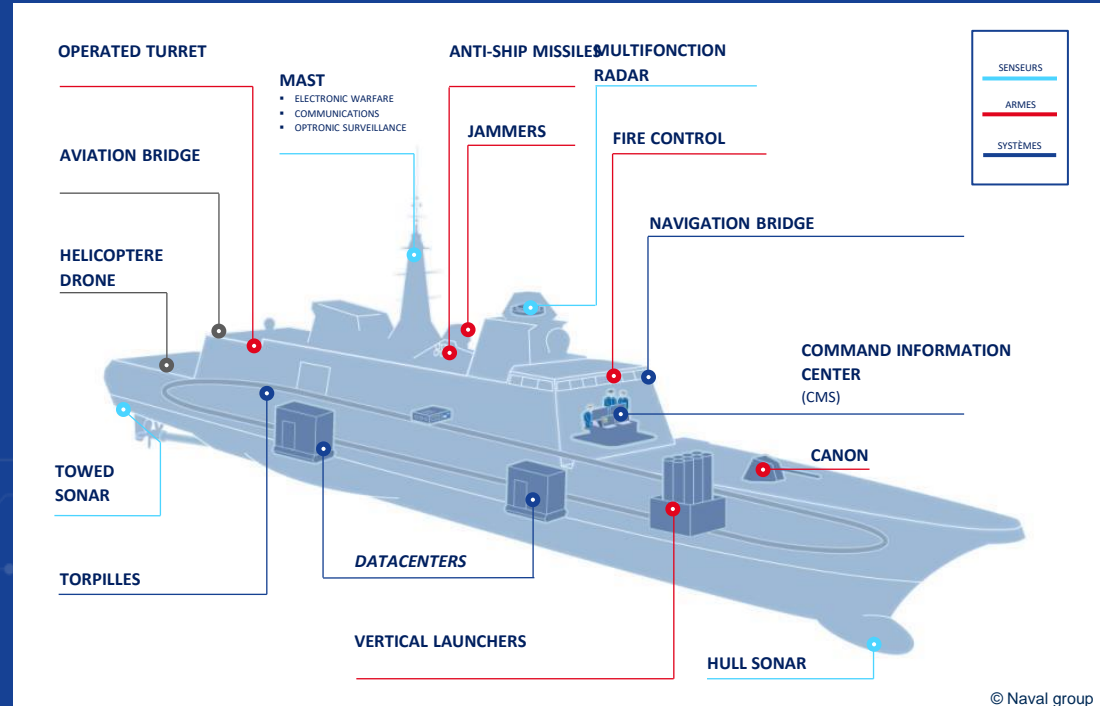
INTEGRATION OF COMPLEX SYSTEMS

Physical
integration

Servitudes
Footprint
Operating conditions

Functional
integration

Network
Data fusion
Human Machine Interface



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MAINTENANCE OF COMPLEX SYSTEMS

Maintenance in
operational
conditions

Robustness
Repairability
Equipment lifespan

Obsolescence
management

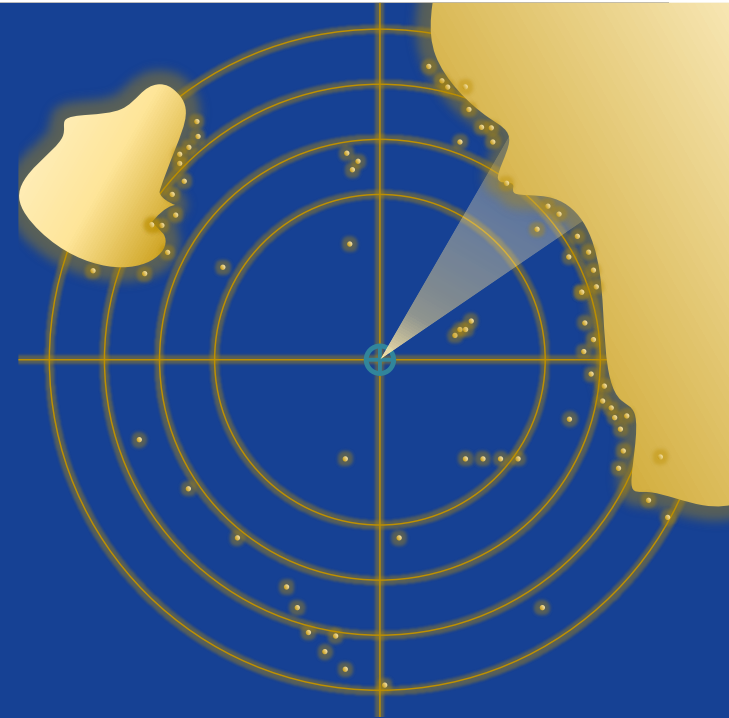
Delivery versions
Retrofit



EXAMPLES OF OPERATIONAL USE CASES

AIR-SURFACE TARGET DETECTION

- ❖ Optronic
 - ❖ Visible
 - ❖ Infra-red
 - ❖ Laser range finder
- ❖ 2D and 3D Radars
- ❖ Communication / Radar signal interception



AIR-SURFACE TARGET DETECTION

❖ Optronic

- ❖ Visible
- ❖ Infra-red
- ❖ Laser range finder

Quantum dots

Single photon avalanche

❖ 2D and 3D Radars

Quantum illumination

❖ Communication / Radar signal

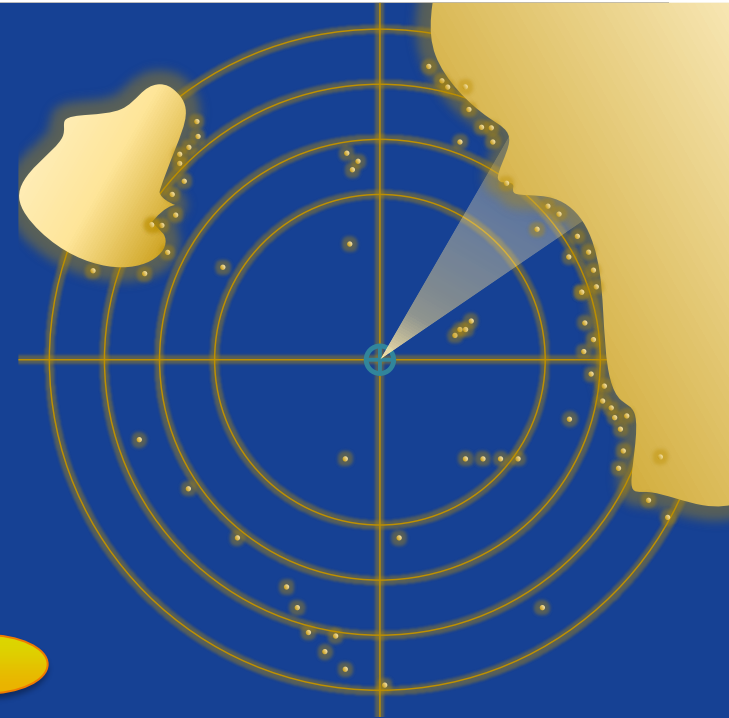
interception

NV centers

Josephson junctions

Spectral hole burning

Rydberg atoms



UNDERWATER TARGET DETECTION

- ❖ Magnetic sensors
 - ❖ Anomaly detection
- ❖ SONAR
 - ❖ Active (forbidden if discretion needed)
 - ❖ Passive
- ❖ Optronic
 - ❖ Noisy environment



UNDERWATER TARGET DETECTION

❖ Magnetic sensors

NV centers

Josephson junctions

Pumped gas cells

❖ Anomaly detection

Rydberg atoms

❖ SONAR

???

❖ Active (forbidden if discretion needed)

❖ Passive

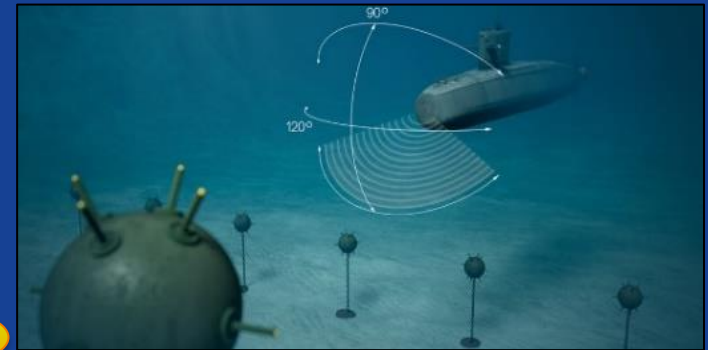
❖ Optronic

Quantum dots

Single photon avalanche

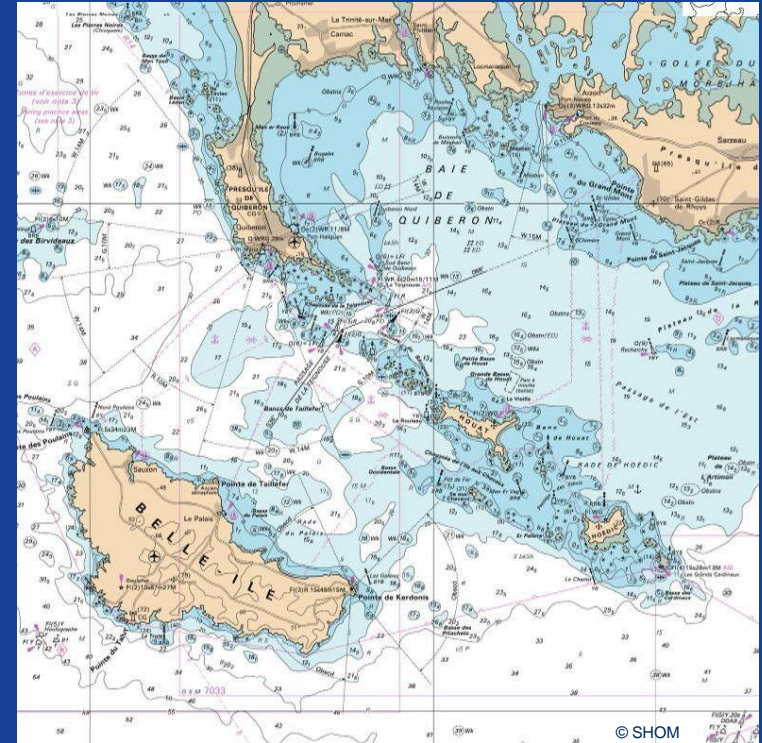
❖ Noisy environment

Quantum illumination



NAVIGATION

- ❖ Position
 - ❖ Absolute position
 - ❖ Inertial calculation
- ❖ Displacement
 - ❖ Linear acceleration
 - ❖ Rotation
- ❖ Time measurement



NAVIGATION

❖ Position

Cold atoms interferometry

❖ Absolute position

❖ Inertial calculation

❖ Displacement

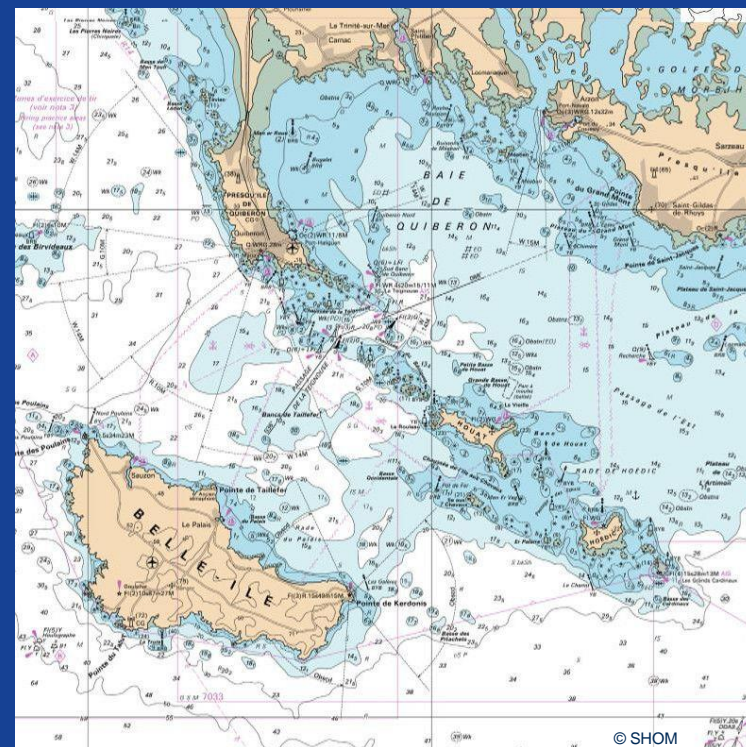
Cold atoms interferometry

❖ Linear acceleration

❖ Rotation

❖ Time measurement

Atomic clock



DIFFERENT NEEDS FOR DIFFERENT USES

EX : DRONE



- Operational interest (limited number of equipments)
- Cost
- Weight / Footprint
- Power consumption
- No restrictive servitudes
- Vibration tolerance
- Resistance to climate conditions

EX : AIRCRAFT CARRIER



- Complementarity with other sensors
- Functional Integrability
- Servitudes disponibility (cold...)
- Vibration tolerance
- Impact resistance
- Cost

NAVAL
GROUP