



CHEBNIKOV LIGHT CONE

KM3NET DETECTION LINES

ALBATROS EM50 INSTRUMENTED LINE

REMOTELY OPERATED VEHICLE (ROV)

# MEUST infrastructure

Mediterranean Eurocentre for Underwater Sciences and Technologies

*P. Lamare for CPPM team*

DETECTION ARRAY 3500 m deep

JUNCTION BOX

ACOUSTIC MODEM

COSMIC NEUTRINO DETECTION PRINCIPLE

INTERACTION

## MEUST a permanent deep cabled observatory:

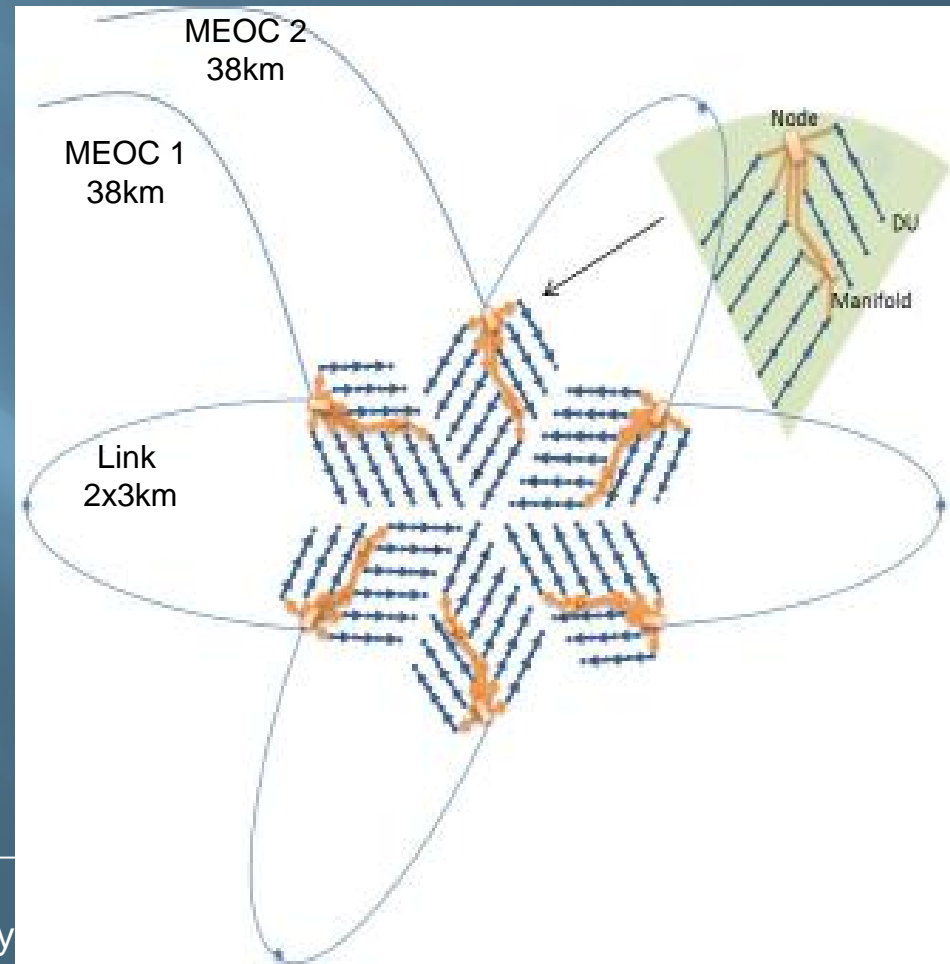
- Physics on neutrinos: KM3NeT-Fr
- Sea Sciences: EMSO-Ligurian node

# Infrastructure overview

- On shore:
  - Control room
  - Power station
- Off shore:
  - User ports with power and fibres for KM3NeT detector
  - User ports for Sea Sciences
  - Vessel and ROV for installation

# Infrastructure concept

- Designed to accommodate high or low energy detector
- Expendable and scalable
- 3 nodes in series on one MEOC
- Possible node recovery for maintenance
- Nodes interconnection on sea surface



## Key numbers

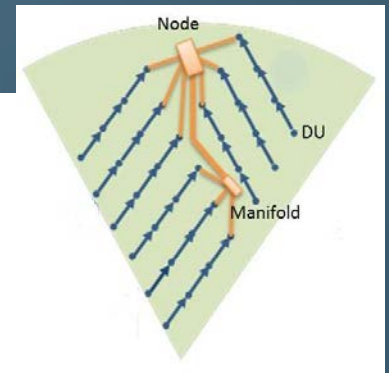
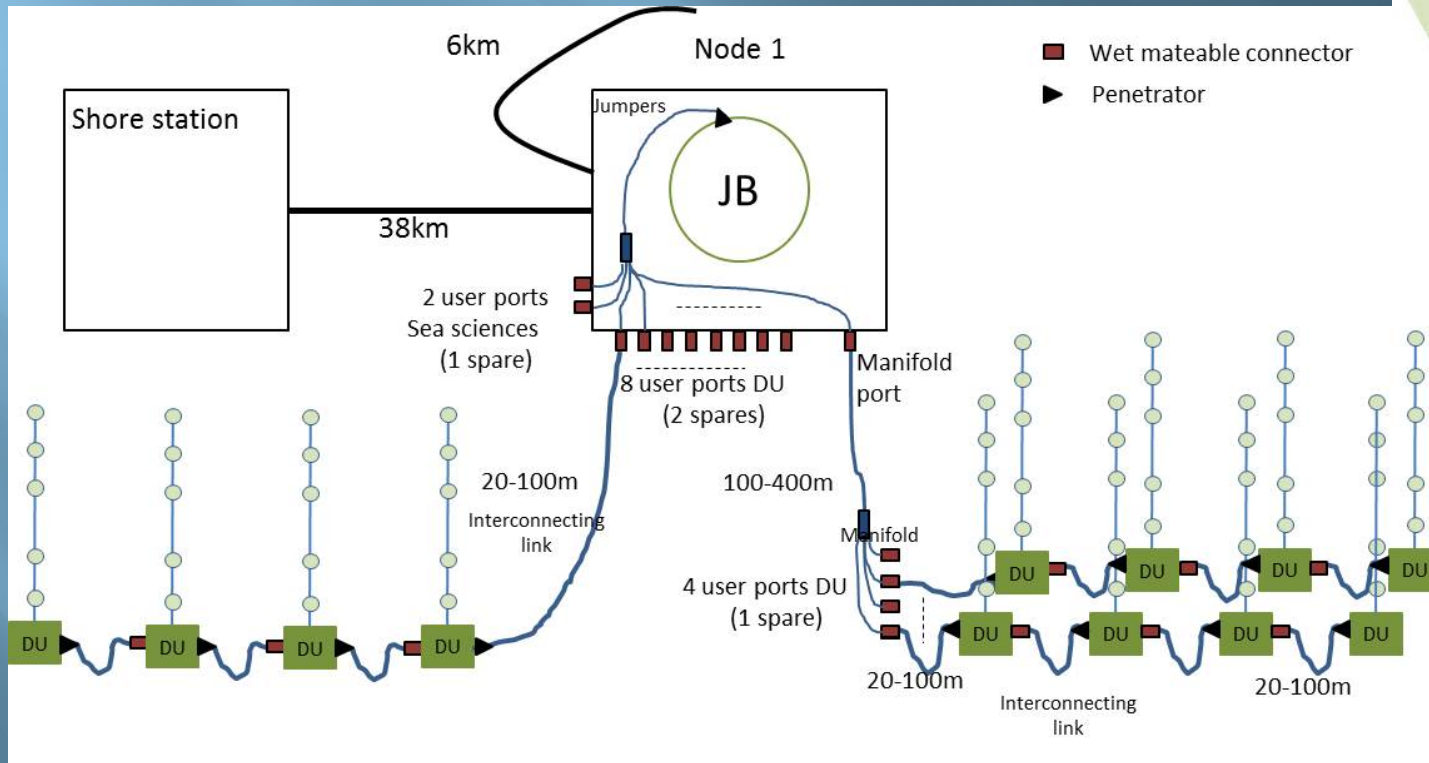
	ORCA	Astronomy
Distance between DU	20 m	100 m
Distance between DOM	6 m	40 m
DU height	150 m	800 m
Nb DU on node	36	36

# Main characteristics

- ❑ 2 MEOCs
- ❑ Up to 216 DUs (108 on one MEOC)
- ❑ 6 nodes (3 on one MEOC)
- ❑ Up to 36 DUs per node
- ❑ 4 DUs connected in series on one node output
- ❑ 1 sea science/multi purpose port per node
- ❑ AC voltage with sea return,  $\sim 3500$  V rms from shore

# Node connections

- Node identical for ORCA or astronomy
- 6 branches of 4 DUs connected on the node
- 3 branches of 4 DUs connected on a deported manifold
- All interlink cables identical

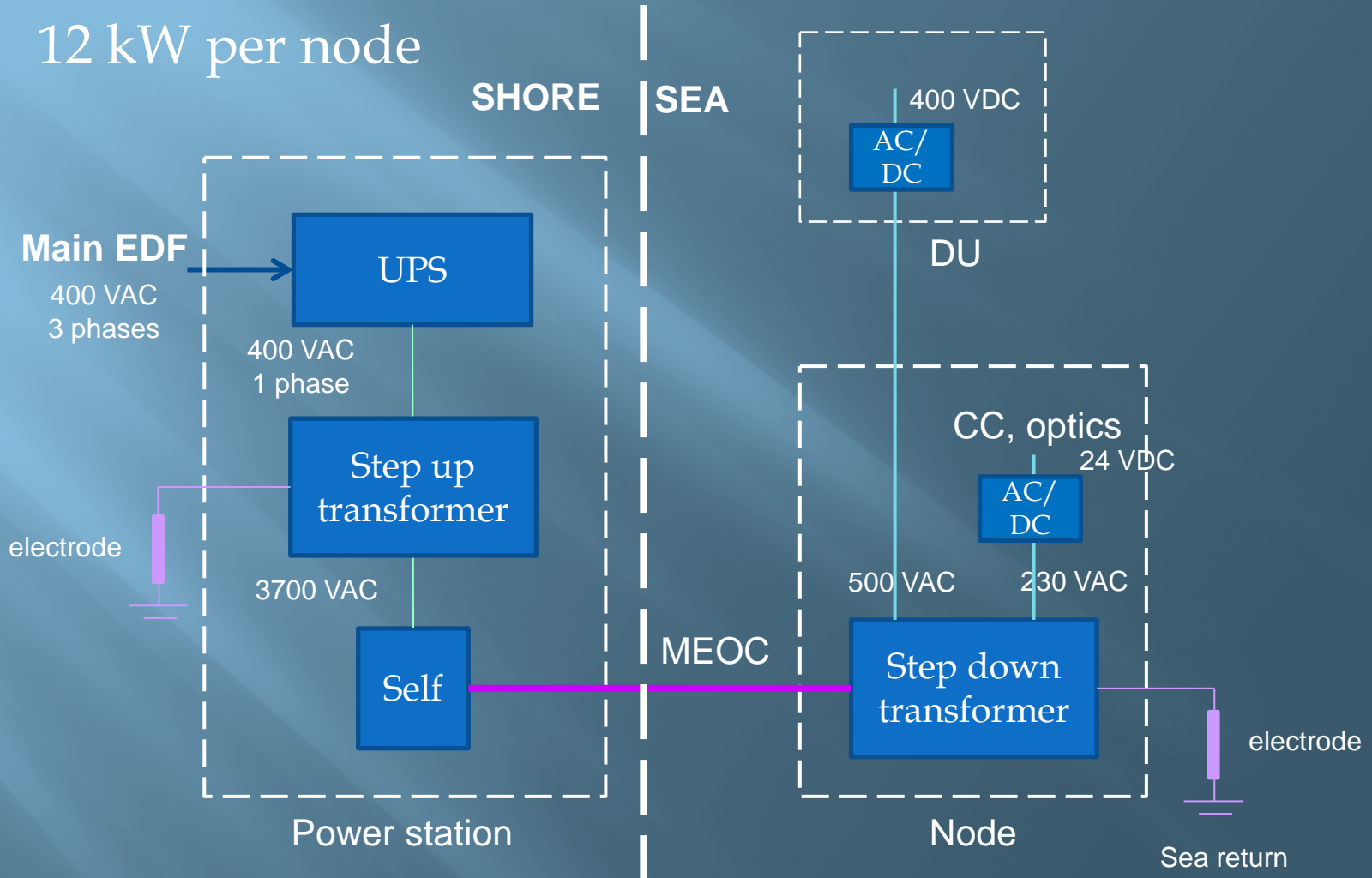


CU can be installed in place of the last DU in a branch when necessary



# Power system

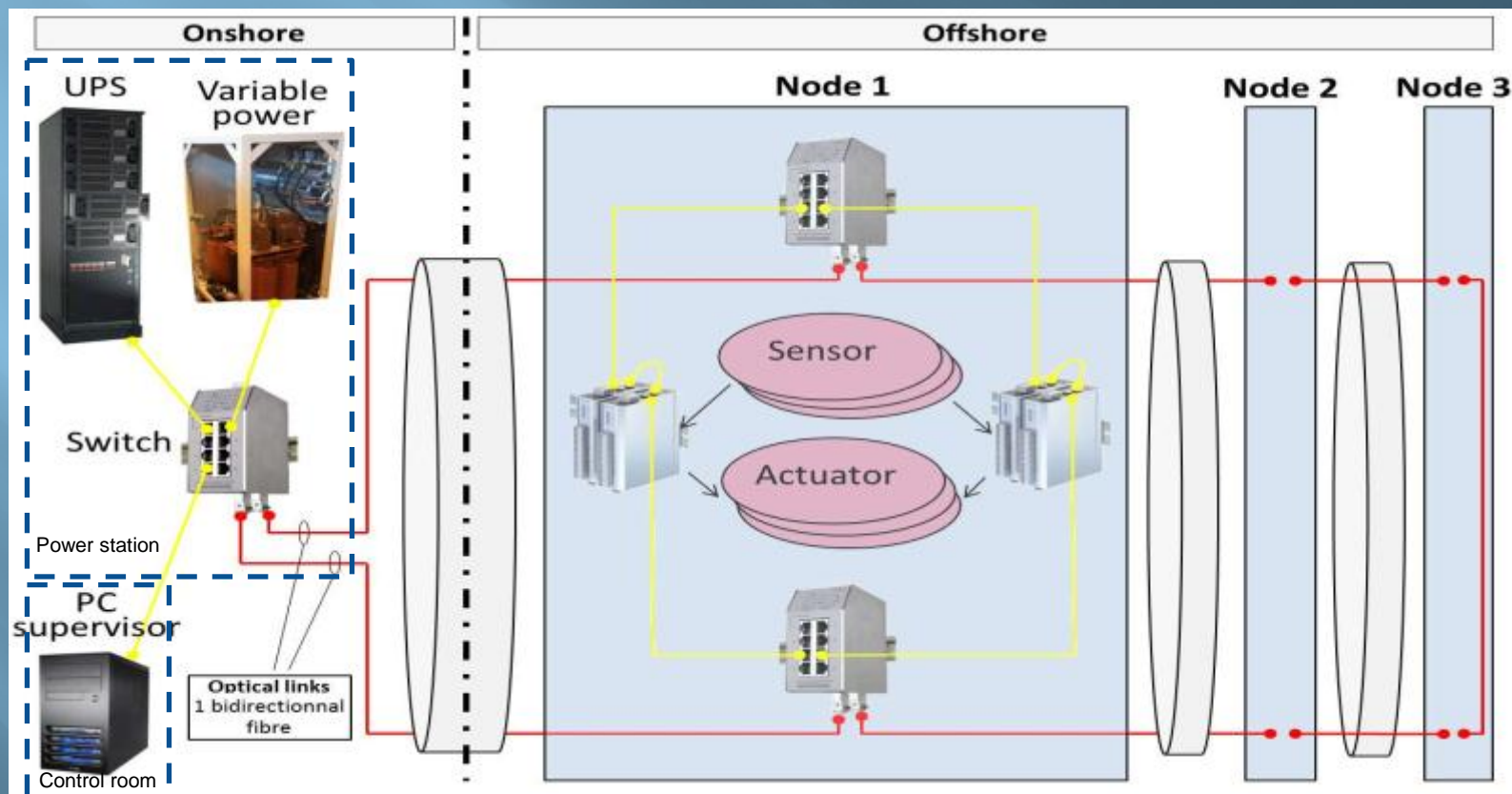
- AC voltage distribution
- 12 kW per node



*See talk from Michel Ageron*

# Control/command

- ❑ Mainly to manage the power system
- ❑ Based on redundant Ethernet network
- ❑ Industrial components

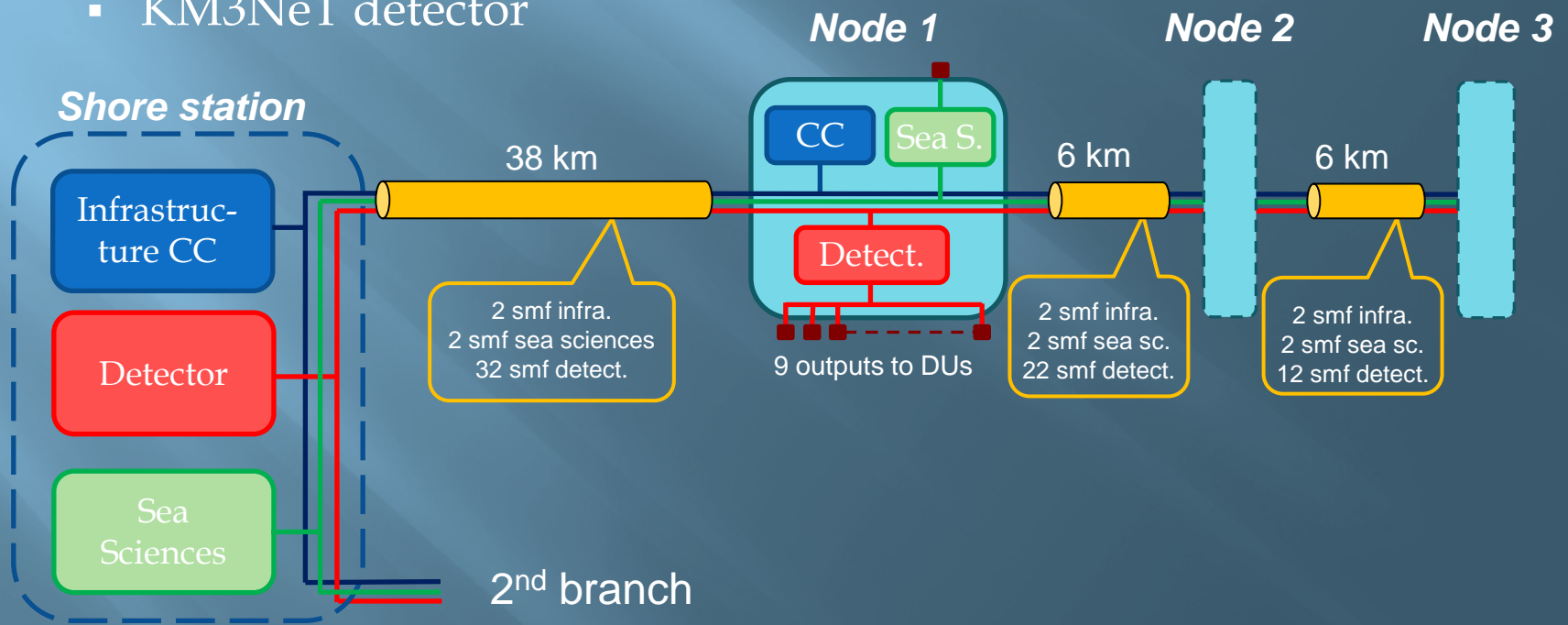


*See talk from Michel Ageron*



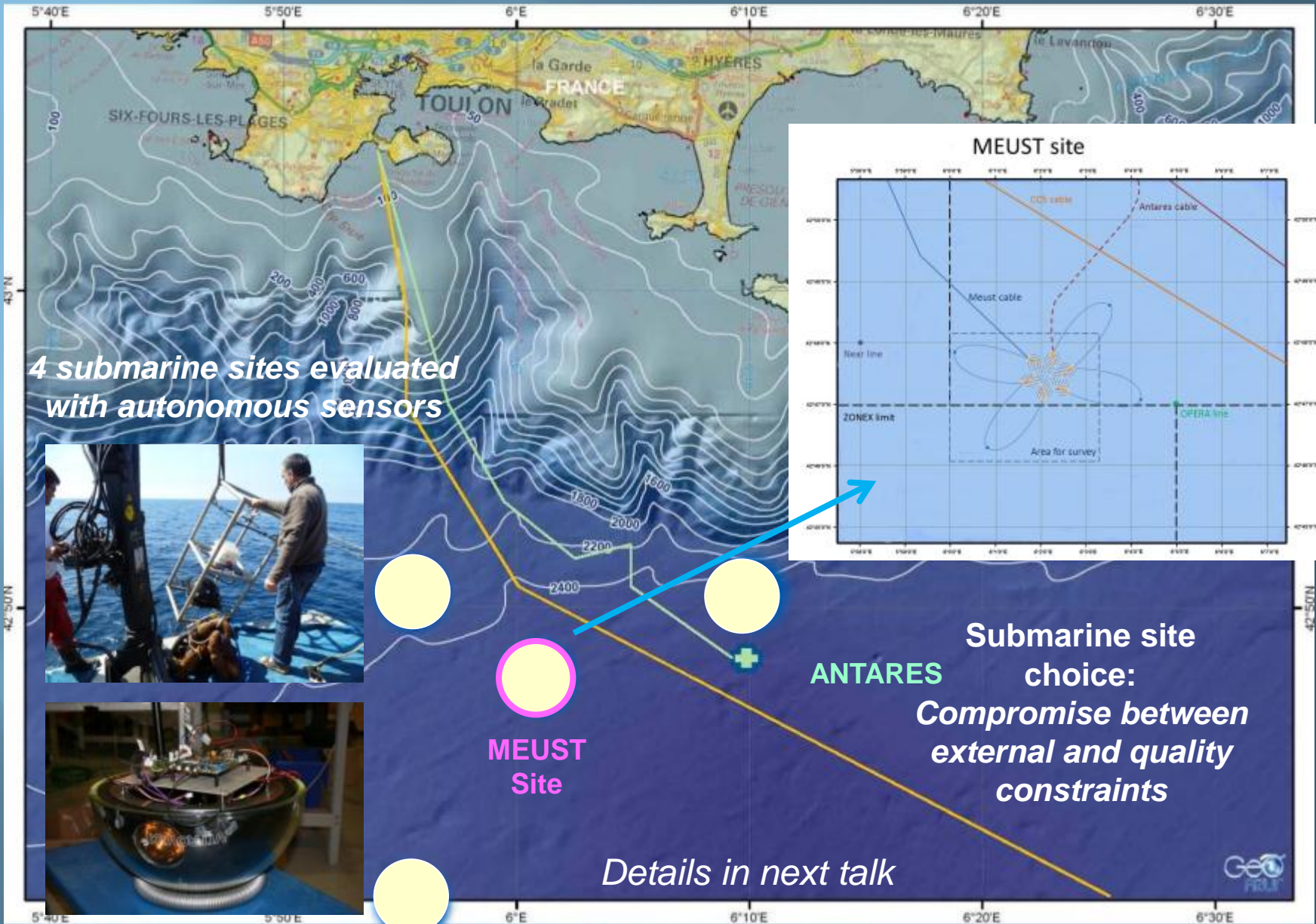
# Optical network

- 36 optical fibres in the MEOC
- 3 independent networks in the infrastructure:
  - Infrastructure control/command
  - Sea Sciences
  - KM3NeT detector

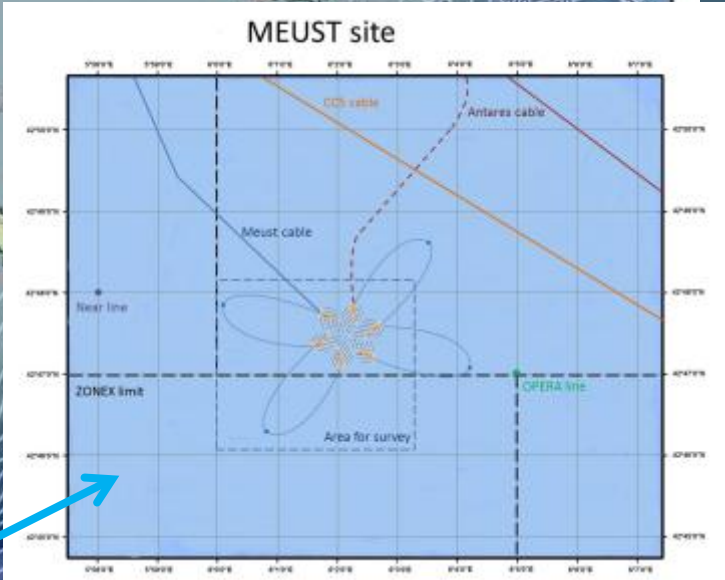
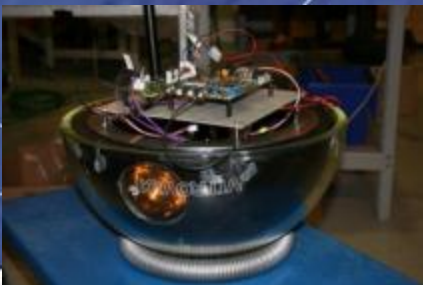


*See talk from Patrick Lamare*

# Submarine site



4 submarine sites evaluated with autonomous sensors



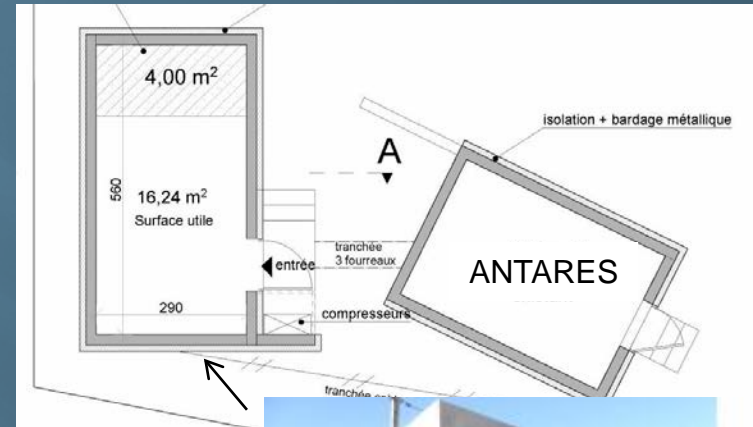
Submarine site choice: **ANTARES** Compromise between external and quality constraints

Details in next talk

# On shore infrastructure

- Power station:
  - New building near Antares one
  - Expected to be completed by March

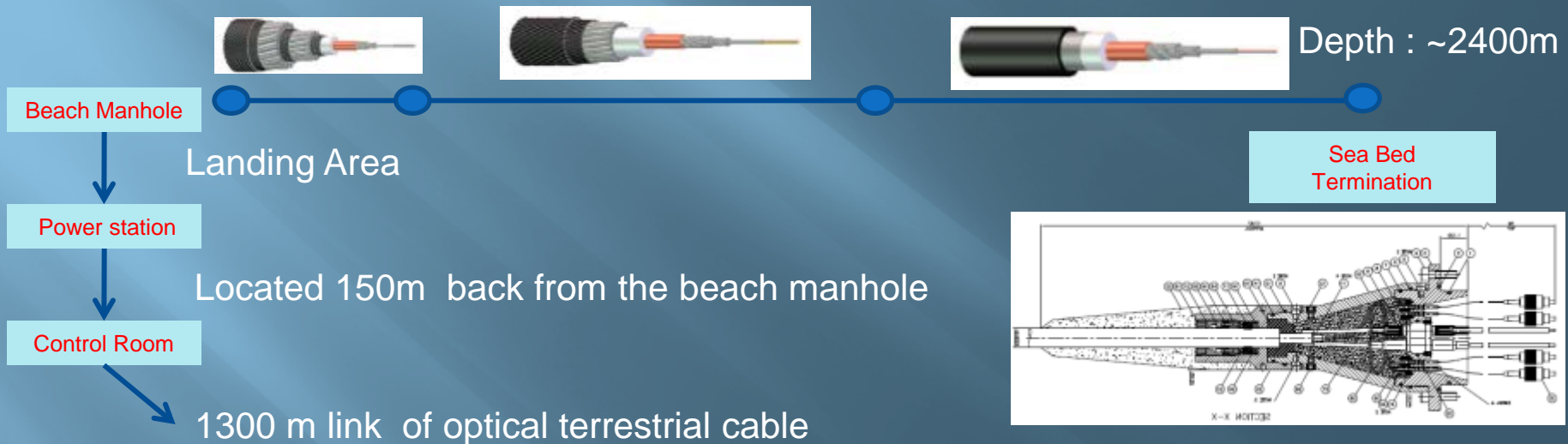
- Control room:
  - Located at IMP to start
  - New CNRS building (near Ifremer) planned to be built in couple of years





# Cable

Alcatel cable OALC7 with 36 LEAF fibres under production  
Termination: Seacon penetrator under development



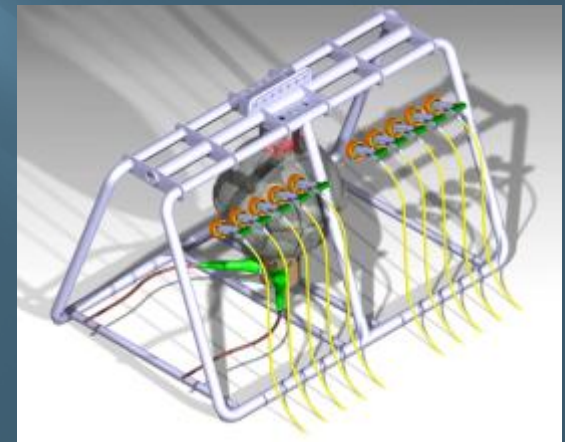
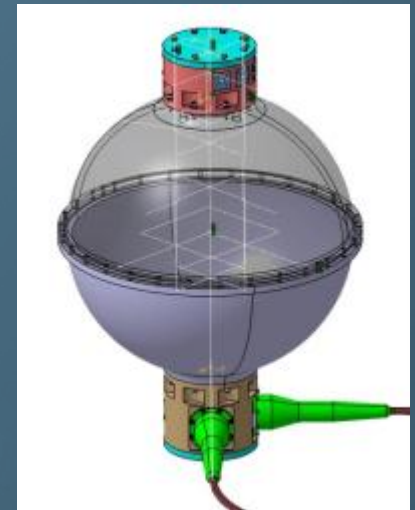
Submarine cable section lengths ordered	
Double Armoured :	2000 m (Sablettes bay )
Single Armoured :	15000 m (< 1500m depth)
Light Weight Protected :	45000m* (>1500m depth)

\*: include cable for link between nodes and spare

# Node

Mainly composed by:

- JB Titanium sphere pressure resistant
  - Lower part in oil: transformer, AC/DC, switches
  - Upper part: Control/command, breakers, optics
- Manifold for ROV connections
  - Tender to be launched soon
- Frame
- Anode for sea return current
- Instrumentation

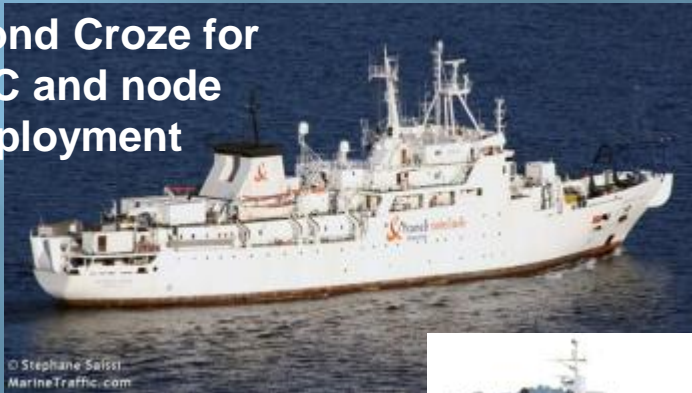


# Deployments

- ❑ Contracts with several companies
- ❑ Infrastructure installation under control:
  - Cable route defined
  - Node deployment procedure defined (some on shore tests performed to be completed with offshore)

France Telecom Marine:

**Raymond Croze for  
MEOC and node  
deployment**



**FOSELEV:  
CASTOR for  
DU deployment**



**IXSURVEY:  
GG9 for light deployments**



# Connections

- ❑ Contracts with IFREMER and COMEX
- ❑ DU connections planned with light ROV
- ❑ Tooling to help light ROV connections under development



**IFREMER:  
ROV VICTOR6000  
for heavy undersea  
operations**



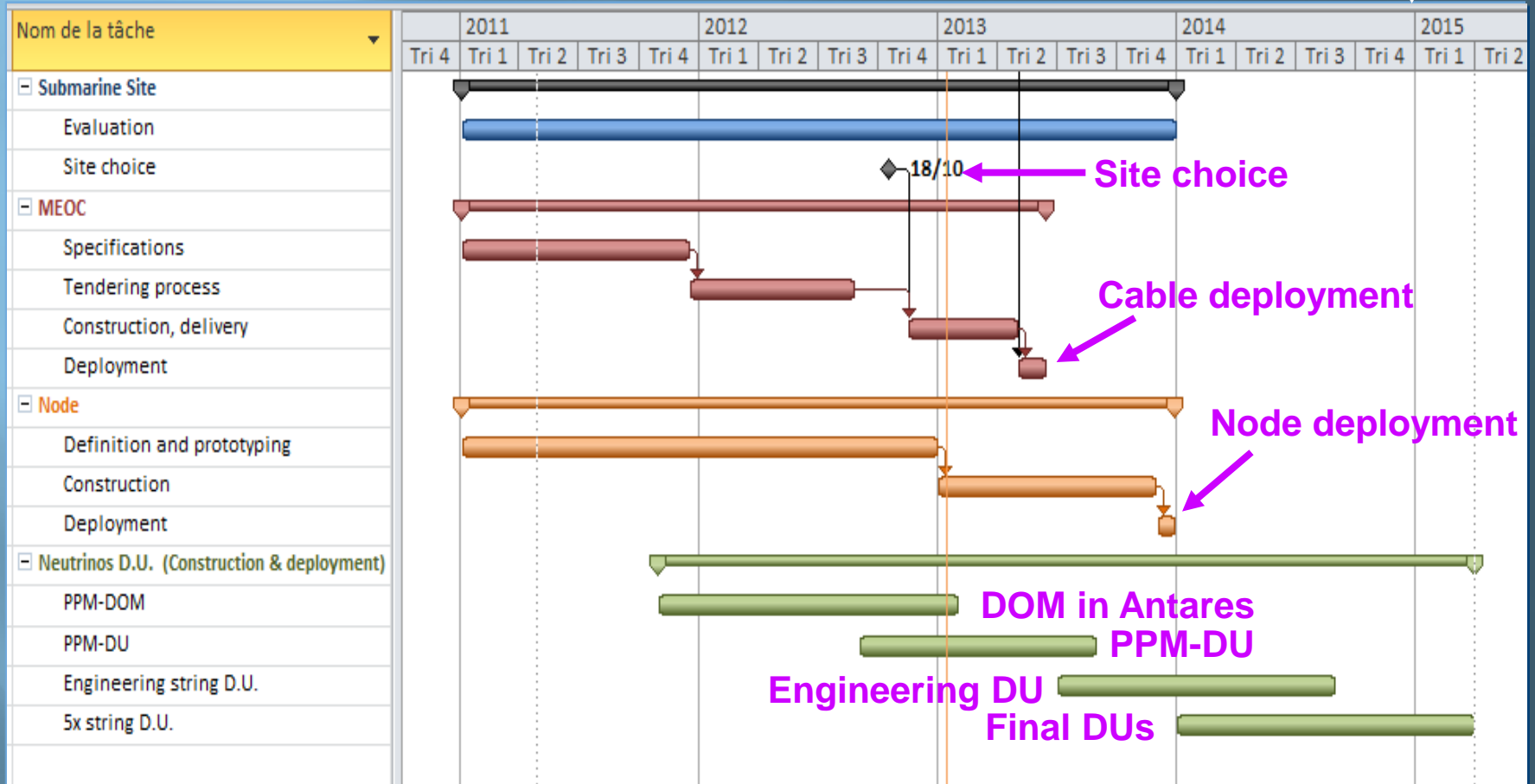
**COMEX:  
ROV APACHE  
for light  
deep operations  
and connections  
(- 2500 m)**



**IFREMER:  
Ongoing discussions  
for participation to  
the new light HROV  
( - 2500m, ≥ 2014)**

# Schedule

Deadline for orders



2013: Infrastructure and PPM-DU

2014: Engineering DU

2015: Final DUs (Compatible with schedule?)

# Summary

- ❑ Construction of the infrastructure underway
- ❑ Node deployment expected end of this year
- ❑ Designed done to be flexible... with some limits!!!
- ❑ Several issues to solve to keep the schedule

## Critical items:

- ❑ For infrastructure development
  - Optical network detector
  - Validation of DUs connection in series
  - Detector layout
- ❑ DU development: final DUs outside MEUST funding schedule?