KM3NeT

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The Calibration Units of KM3NeT

R. Le Breton, M. Billault, C. Boutonnet, C. Champion, S. Colonges, A. Cosquer, A. Creusot, S. Henry, A. Ilioni, P. Keller, P. Lagier, R. Lahmann, P. Lamare, J. Lesrel, M. Lindsey Clark, J. Royon, G. Riccobene, D. Samtleben, V. Van Elewyck

On behalf of the KM3NeT Collaboration

cnrs IN2P3 Les deux infinis

APC

CENTRE DE PHYSIQUE DES PARTICULES DE MARSEILLE CPPM

Labex UnivEarthS

INVESTIR L'AVENIR

KM3NeT and the Calibration Units

KM3NeT: Kilometer Cube Neutrino Telescope

S. Adrian- Martinez et al., Letter of Intent for KM3NeT 2.0:
https://arxiv.org/abs/1601.07459

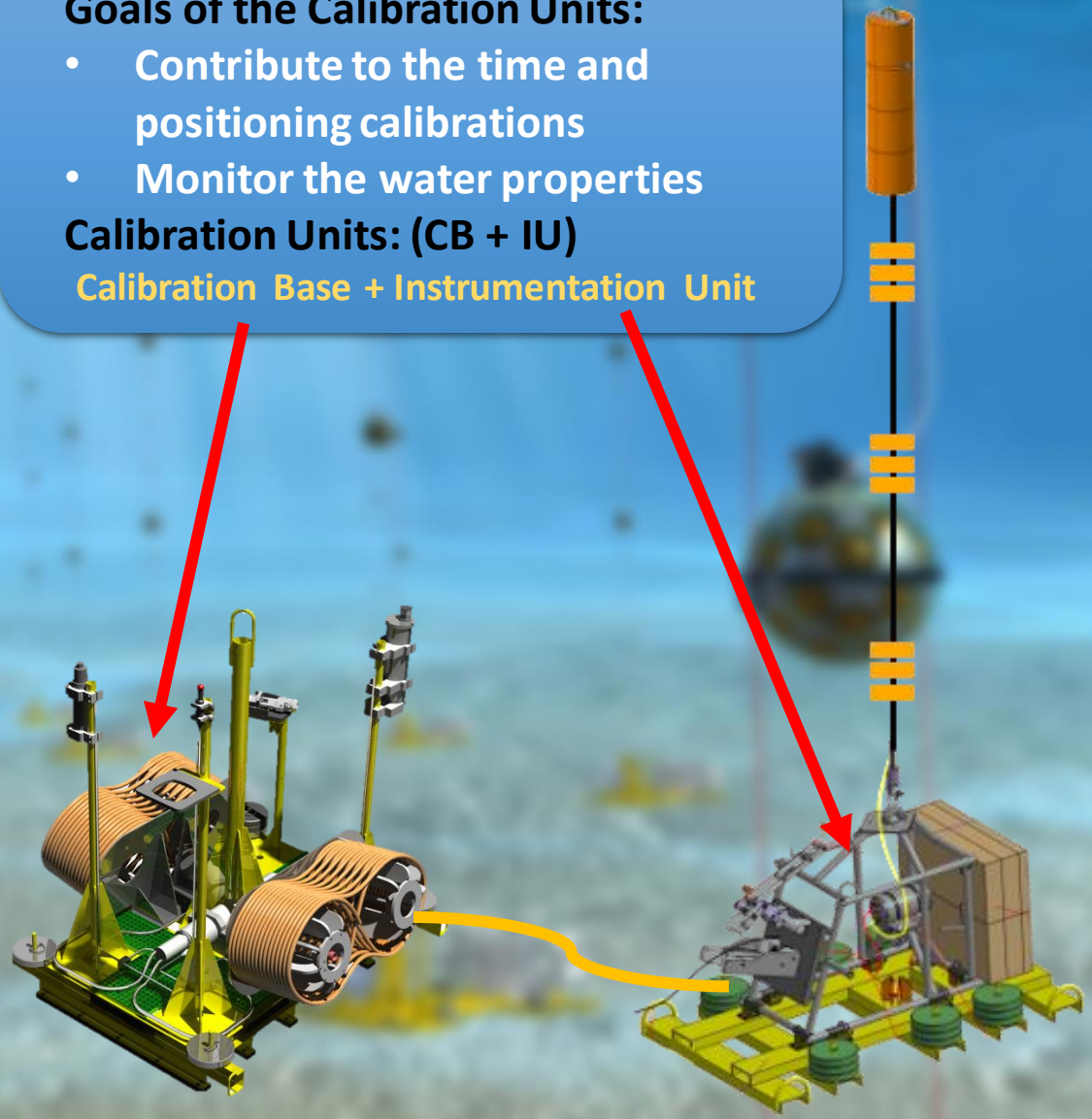
ORCA : Oscillation Research with Cosmics in the Abyss
- 8 Mton instrumented
- Low Energies : ~ GeV

ARCA : Astroparticle Research with Cosmics in the Abyss
- 1 Gton instrumented
- High Energies : GeV to PeV

Two detectors <=> Same Technology
Digital Optical Module (DOM)

Goals of the Calibration Units:
- Contribute to the time and positioning calibrations
- Monitor the water properties

Calibration Units: (CB + IU)
Calibration Base + Instrumentation Unit

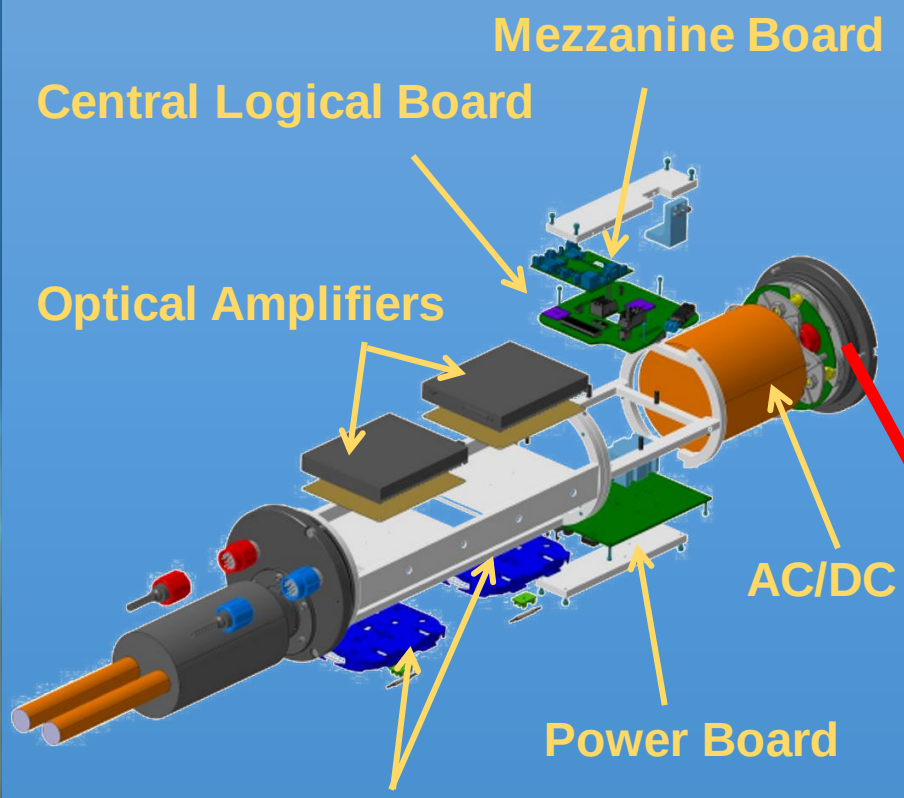


Calibration Goals:
- Time: 1ns
- Position: 10cm

This contribution: focus on the ORCA Calibration Unit

Calibration Base

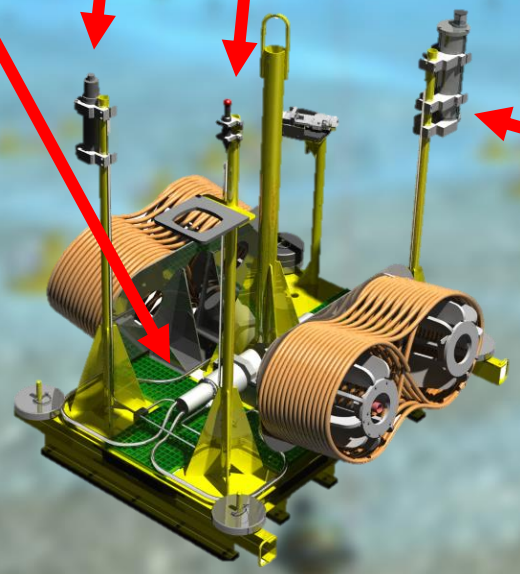
"Central Unit" of the Calibration Unit



Positioning

Two acoustic devices:

- Hydrophone
- Emitter

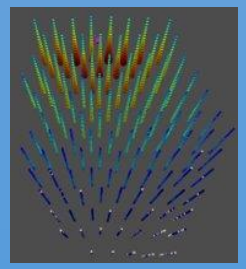


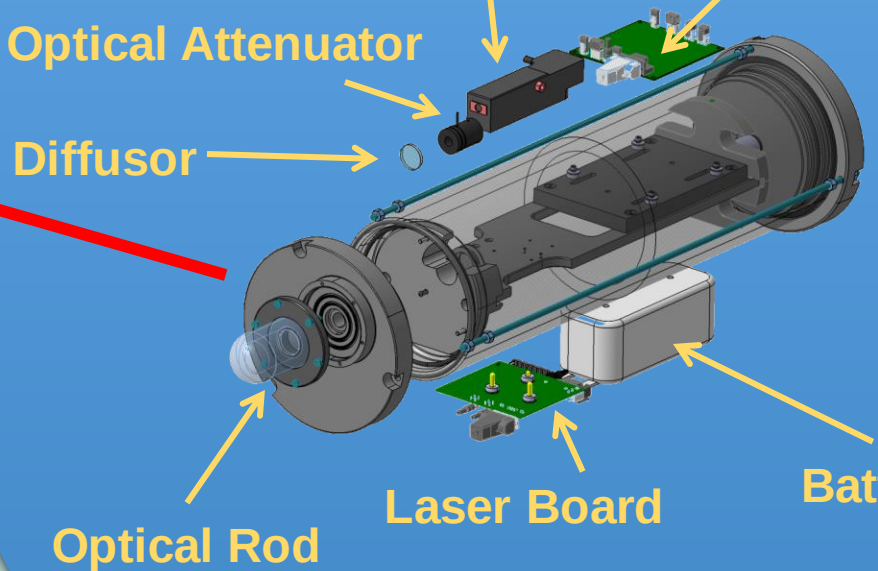
Time Calibration

Laser: 0.4 ns FWHM, 3.8 µJ pulse, 532 nm, pulses up to 4 kHz

Optical simulation:

- Check design, agreement with specifications





This contribution: focus on the ORCA Calibration Unit

Instrumentation Unit

Positioning Calibration of the Detector

- Used to monitor sea water properties
- Compute the speed of sound and speed of sea currents, needed for the positioning system

Composed of:

- Instrumentation Base titanium container: electronics boards
- Anchor: keeps the system on the seabed.
- Instrumented Line: inductive cable, autonomous instruments

Same inductive instruments at 3 different elevations:

- Current meter: AQUADOPP from Nortek
- CTD sensor: Conductivity, Temperature, Pressure. Used to infer the sound velocity thanks to the seawater equation of state, SBE SMP CTD device from Seabird
- Sound Velocimeter: Mini SVS from Valeport

The Instrumentation Unit will be recovered every couple of years for recalibration of instruments and replacement of the batteries