

KM3NeT_IT_CT

Nunzio Randazzo - INFN Catania

KM3NeT_ IT_CT - Main Roles in the KM3NeT Project

- Deputy DOM integration : Emanuele Leonora
- Catania DOM integration Site Responsible. E. Leonora
- DOM production: F. Longhitano
- Local Quality Supervisor: R. Bruno

DOM Activities

- Junction Box Project Manager: N. Randazzo
- Marine operation: N. Randazzo

Junction Box Activities

- design of the new DOM testing environment : R. Bruno
- DPDQ co-convenorship : Anna Sinopoulou
- Multimessenger Astronomy: Iara Tosta e Melo

Software e Data Analysis

Nothing going on without the crucial support from our technicians:

G. Imperiale 100% (PNRR)
E. Cafici 100% (PNRR)
G. Richichi 100% (PNRR)

Antonio Grimaldi

Domenico Sciliberto

Francesco Librizzi

Maurizio Salemi

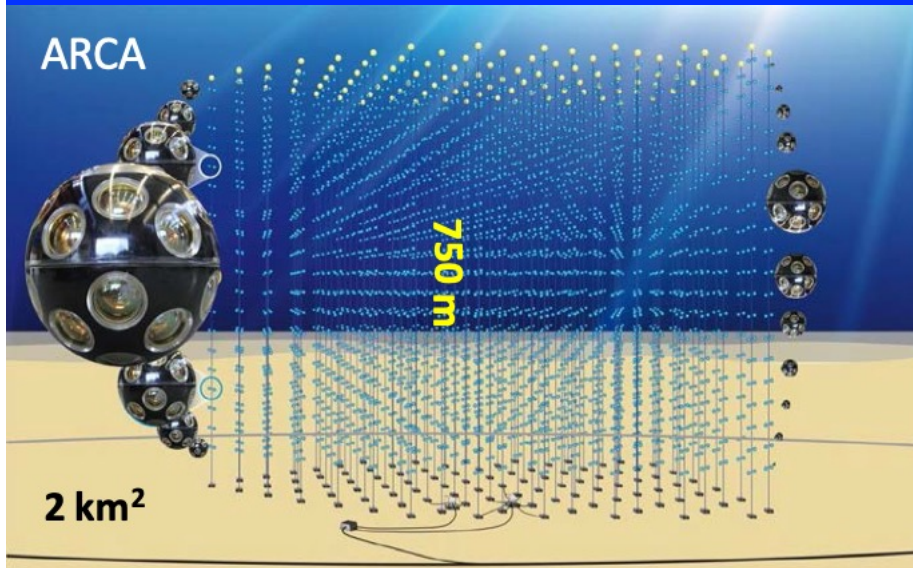
Antonio Rapicavoli

Technical Activities





REQUIREMENTS FROM SCIENCE

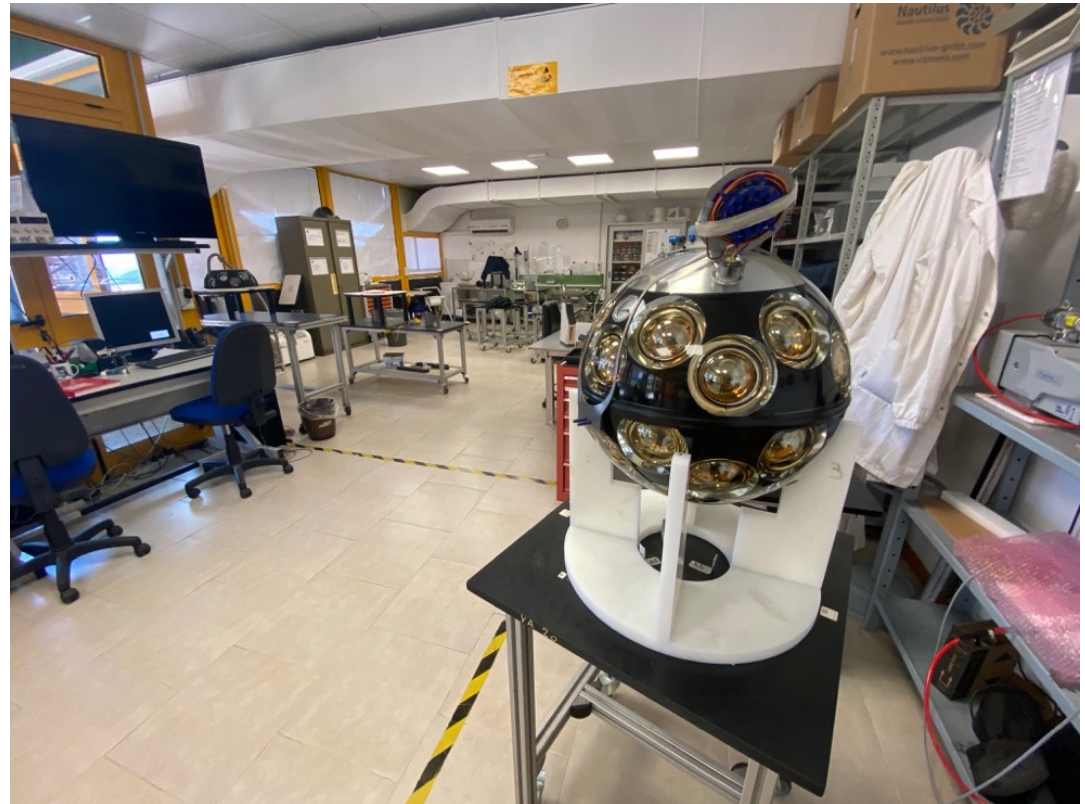


- Tridimensional optical array sensors in a km³
- Power and optical path transportation and distribution

KM3NeT_IT_CT – DOM INTEGRATION SITE

Production till June 2024 - Expected 2025

- Until now 54 WWRS DOMs has been produced in Catania and delivered always by the estimated time
- Thanks to all the technicians involved in DOM production we reached a rate of 3 DOMs at week
- A new DU of other 18 DOMs is under construction and will be delivered at the end on July



Other activities: DOM Refurbishment

In November 2023 we were involved in special actions in the DU integration site of Catania: refurbishment of DOMs from Detection Units recovered from Sea

Activities needed to be done at the DU integration site of the Harbour of Catania

The tools had to be moved from the DOM integration site to the DU integration site

- Refurbishment of 18 DOMs of ARCA DU 66
- Refurbishment of 1 DOM of DU 46

It was a very challenging work for a very special team !!!

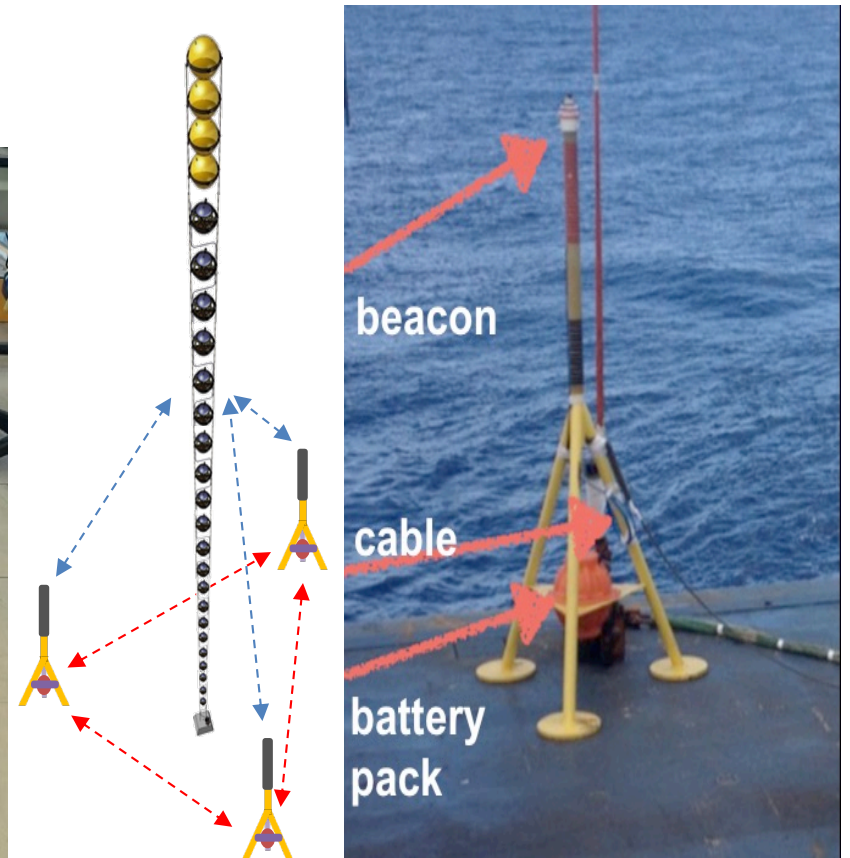


UPDATES ON DOM site activities: battery packs

4 Battery Packs for the KM3Net acoustic position system have been produced for the next marine campaign of September

- The production is in charge of a local company in Catania (TEKTRON)
- INFN-Catania performs cabling, final test and marinization of the system before delivering

Other 2 battery packs will be constructed for the next marine campaign on France ORCA site, in next November 2024



Analysis coordinators: Thierry P. and Iara T.M.

Sub-threshold joint analysis using low significance events

Triggered analysis both modelled and unmodelled

Other activities over the past year:

Development of a multimessenger manual online search where the user can search for a HEN in correspondence with an external trigger of choice:

Testing the pipeline for manual purpose has been done and now it needs to be implemented in the shifter tools of online searches.

Organization/participation of a multimessenger event entitled:

1st Astrophysics in the New Era of Multi Messenger Astronomy International Conference

UNIFAL (Brazil) members has recently entered KM3Net:

- Professor Cassius Melo

Status: formation activities being carried out to the group. First up: training for the online multimessenger shifts. Second: training on GWHEN analysis

Data Processing & Data Quality WG - KM3NeT

Anna Sinopoulou, KM3NeT DPDQ convener



SNAKEMAKE data processing workflow used for the first time!

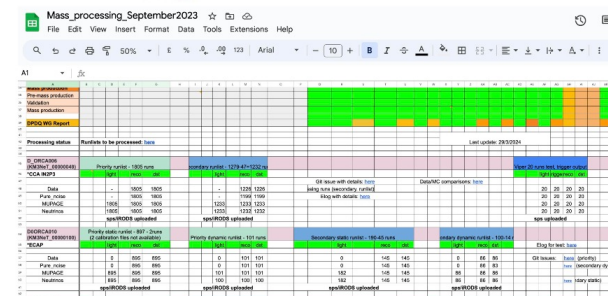
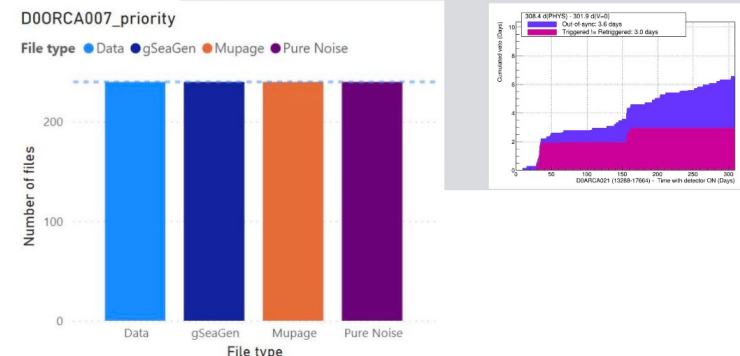
1. Simultaneously use of **5 Computing Centers** (Lyon, CNAF, Stoomboot, Woody,Viper).
2. **More than 4 years of data processed in ~5 months.**
3. **In parallel**, data reconstruction, pure noise, atm. muon and neutrino MC production (run-wise).

Data Quality checks and runlists for analyses online for the first time!

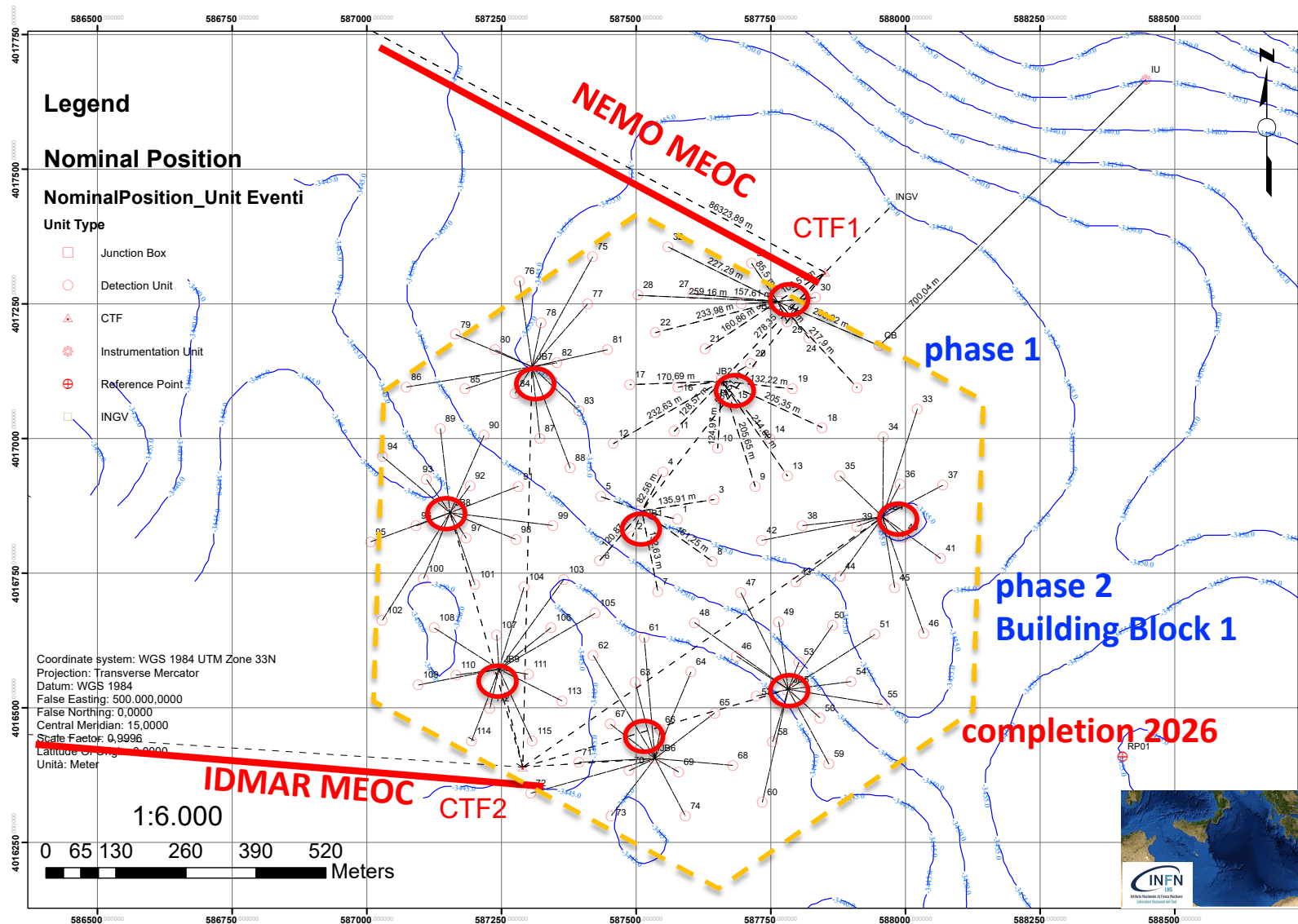
1. Implementation of **webpage for online performance monitoring.**
2. **Strategy** for data/MC, data/data and tool development for fast DQ checks.
3. Runlists tags for different analyses provided online.
4. **Operations, calibrations, processing defects** reported online.

Group Organization (new)

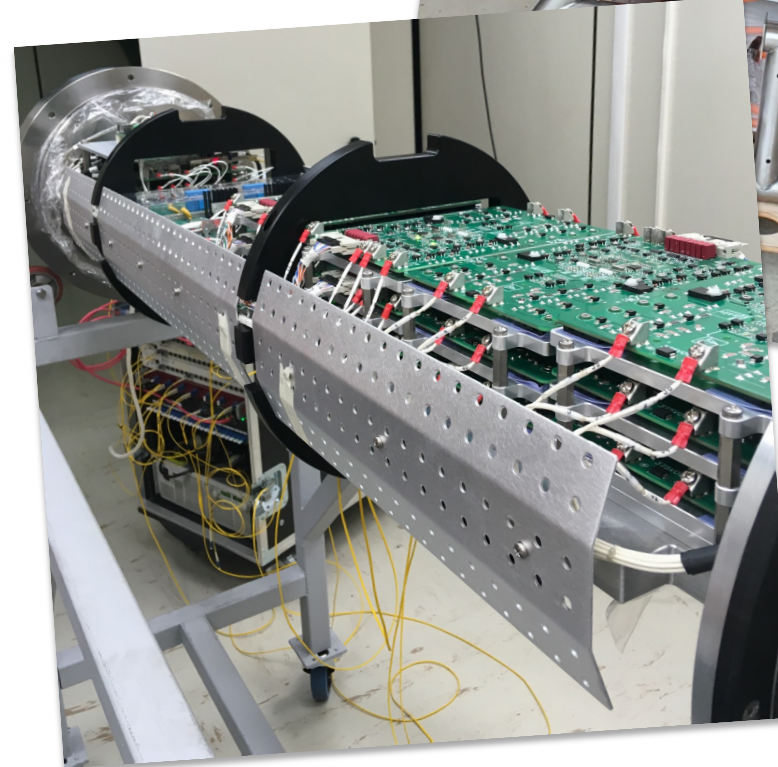
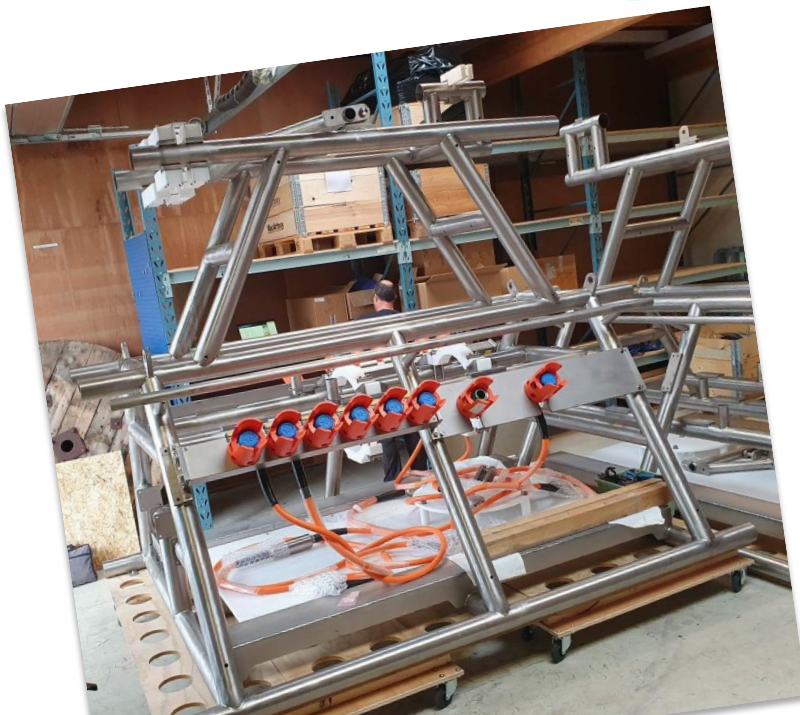
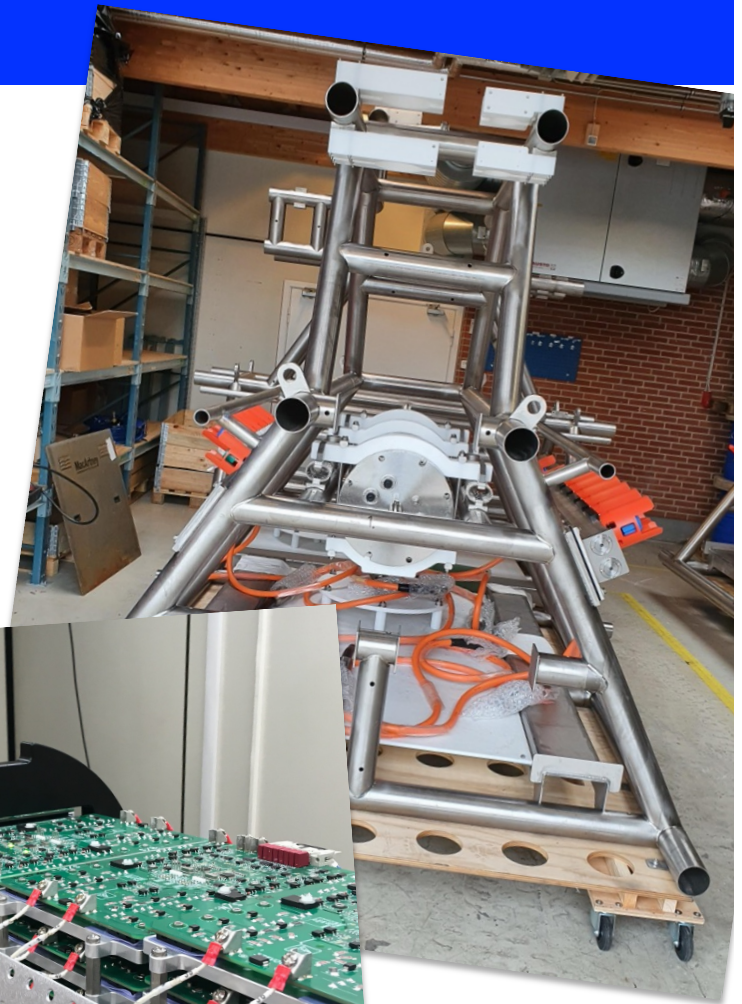
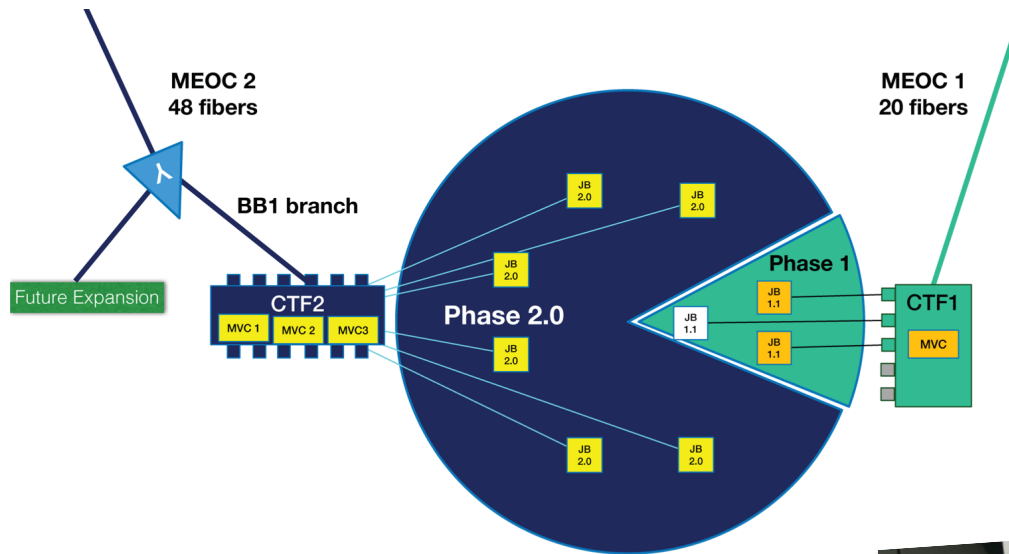
1. Spreadsheet for online monitoring of the processing of each data taking period.
2. Rocket chat channels for online communication with conveners and experts.
3. Bi-weekly meetings for status reports.
4. Weekly issue solving meetings during the mass processing period.
5. Dedicated meetings for feedback and performance optimization.



SEABED NETWORK



KM3NeT_IT_CT – JB development activities



Production of JB1.1 SN-01-02-03 — Final integration in Denmark



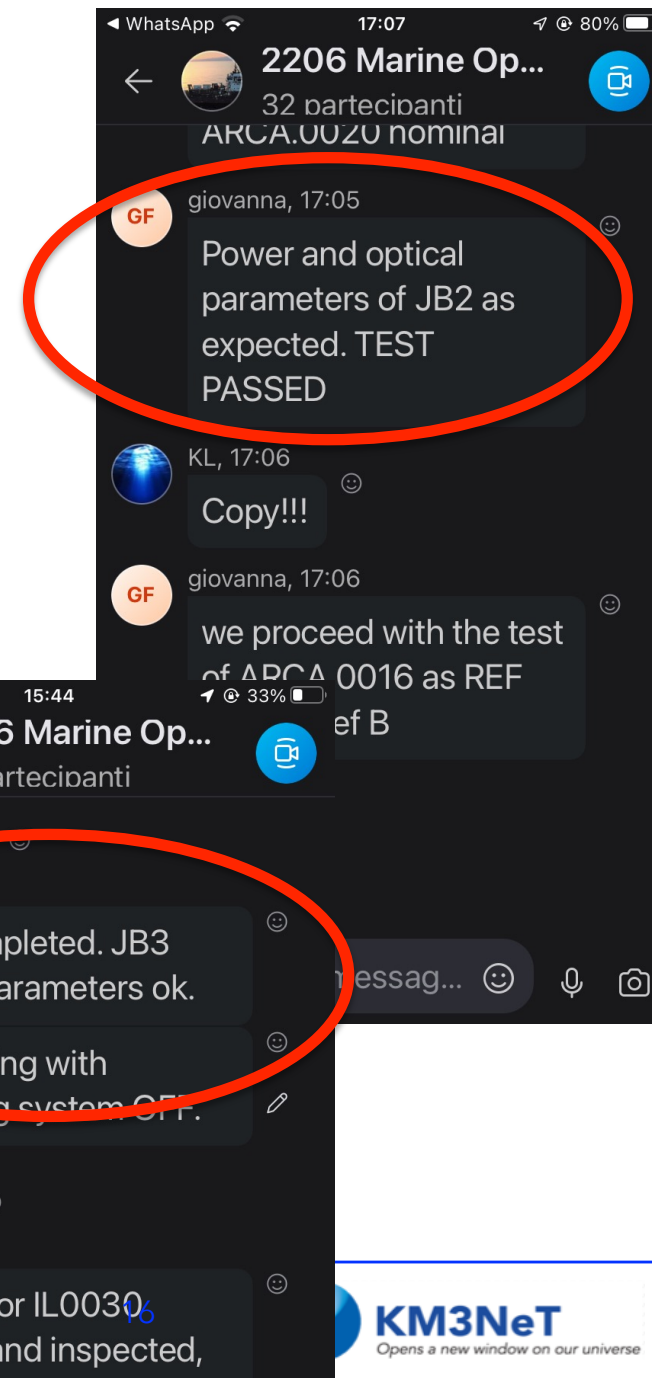
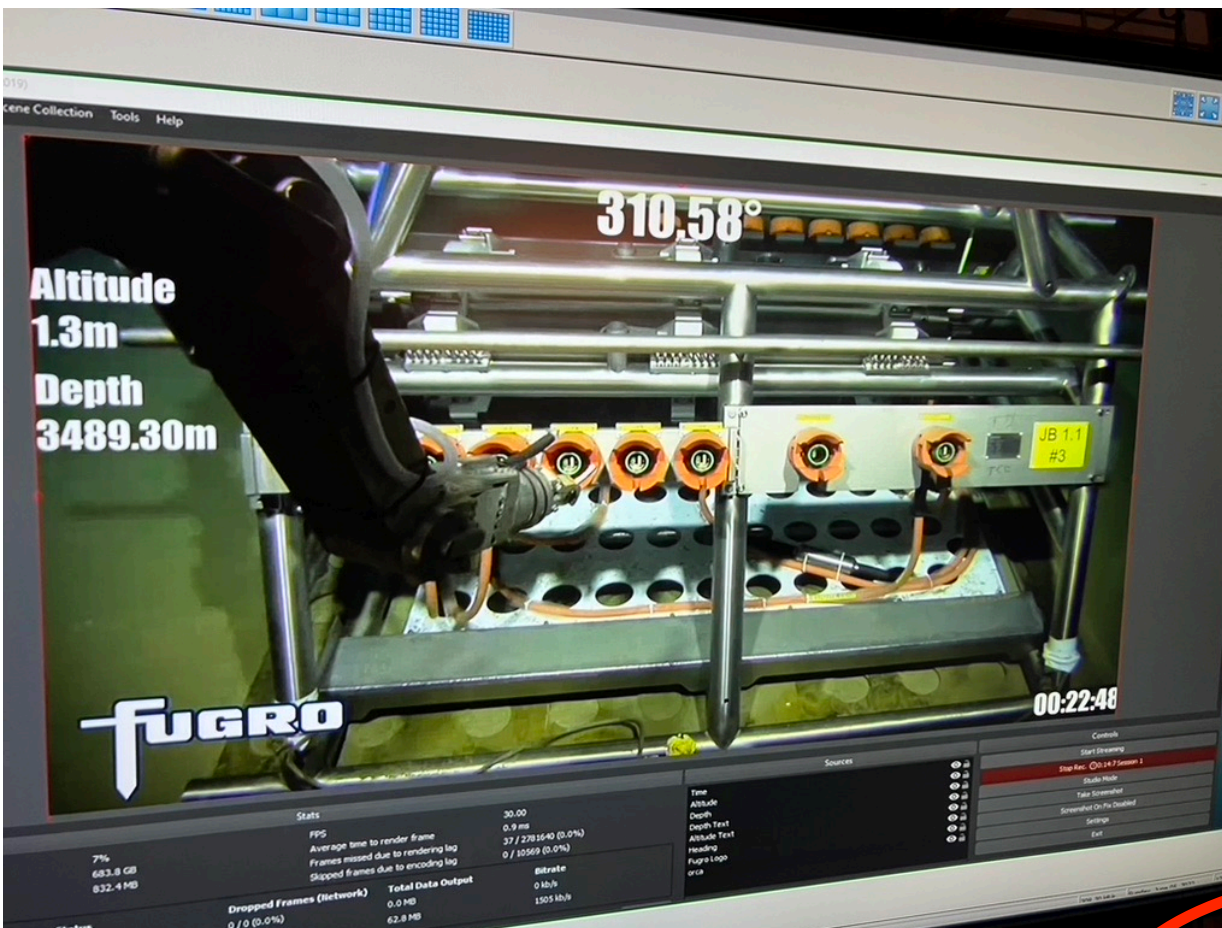
Production of JB1.1 SN-01 -02-03 – Harbour of Malta - Ready to board



Production of JB1.1 SN-02-03 - On board - Ready to deploy @ 3400 mt depth



Production of JB1.1 SN-02-03 – Nominal and working well on seabed



Production of more JBs Phase 2 – PNRR funds more than 8M€ @INFNCT



INFN - Italy

System design - Electronics design – Project Management

NIKEF - The Netherlands

Optical design

MacArtney - Denmark

Mechanical design and construction - Final assembly

Teledyne submarine - Ocean design - Florida (USA)

underwater connector

MB Elettronica - Italy

Boards production

Elmacom - Italy

Electronics design - Board testing- Internal vessel mechanical design

Wiring - Board integration

FUGRO - California (USA)

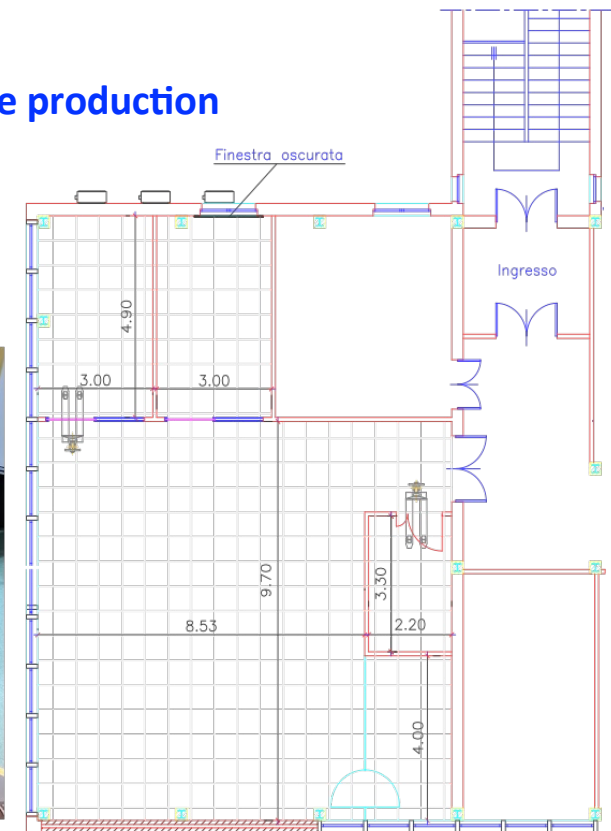
Deployment and underwater connection

- **DOM production**
 - to be continued (present production capability 1 DU every 2months)
- **Activities on KM3NeT-IT Site**
 - Project management production # 6 - JB 2.0
 - Documents management
- **Marine campaigns**
 - Survey/maintenance of the Seabed network
 - Multiple deployment of JBs/DUs
- **Outreach**
 - ...as usual
- **KM3NET4RR (PNRR 67 M€)**
 - New DOM integration lab (building 10)
 - Six more JB2.0 to build

We are working to arrange a second DOM integration site in Catania thanks to PNRR found (Edificio 10. Secondo piano. Cittadella Universitaria)

We are working on the purchasing of new tools to increase the rate of the production

- gel mixing machine
- machine to electrically bend the deflector rings
- machine to close the DOMs



Procedures under going for purchasing tools and machines

2 procedures under going for construction works in the second DOM integration site

... estimated cost : 480 k euros ... estimated time: ready for January 2024!

KM3NeT_ IT_CT– Planned Activities 2025

Work to build the second DOM integration site in Catania is completed.

We still need the construction of the external lift to move all the new instrumentations (the new site is at a first floor)

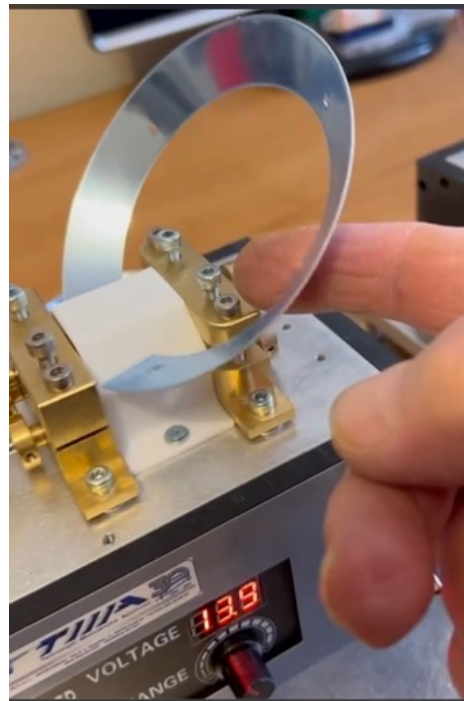
→ Realistic date for the beginning of the DOM integration could be September 2024



KM3NeT_ IT_CT– Planned Activities 2025

Design and improvements of new tools and instrumentation to increase the rate of the DOM production

- purchasing of two gel mixing machines (like those already used in NIKHEF). Delivering foreseen for the end of June
- purchasing of two machines to automatically bend the PMTs deflector rings (designed and made by a company in Catania)
- design and construction of two machines to rotate and close the DOM (designed by INFN Catania F. Longhitano. F. Librizzi)



KM3NeT_IT_CT – Outreach activities



The Giorgos-Androulakis-Prize (GAP) for technicians and engineers



For the 2024 edition, **Riccardo Bruno** from the INFN Department of Catania has been selected to receive the GAP-ECS award.

This recognition is in honor of his work on developing a software suite essential for testing and validating WWRS DOMs.

Thanks to his work, more than 600 DOMs have been produced, enabling the deployment of 19 DUs in the upcoming marine campaign in September

- **People**

Nunzio Randazzo	70 % (Dirigente Tecnologo -RL)
Emanuele Leonora	70% (Primo Tecnologo)
Fabio Longhitano	80% (Tecnologo)
Riccardo Bruno	70% (Tecnologo)
Anna Sinopoulou	100% (Ricercatore Borsa di studio per stranieri)
Iara Tosta e Melo	Formally 10 % (RTDA -PNRR)

4.1 FTE

Technicians (5 months)

Antonio Grimaldi
Francesco Librizzi
Carlo Rocca
Maurizio Salemi
Domenico Sciliberto

G. Imperiale	100% (PNRR)
E. Cafici	100% (PNRR)
G. Richichi	100% (PNRR)

- **Financial request**

- travelling 80 k€
- Lab DOM consumable 20 k€
- DOM transportation to DU integration site about 25 k€