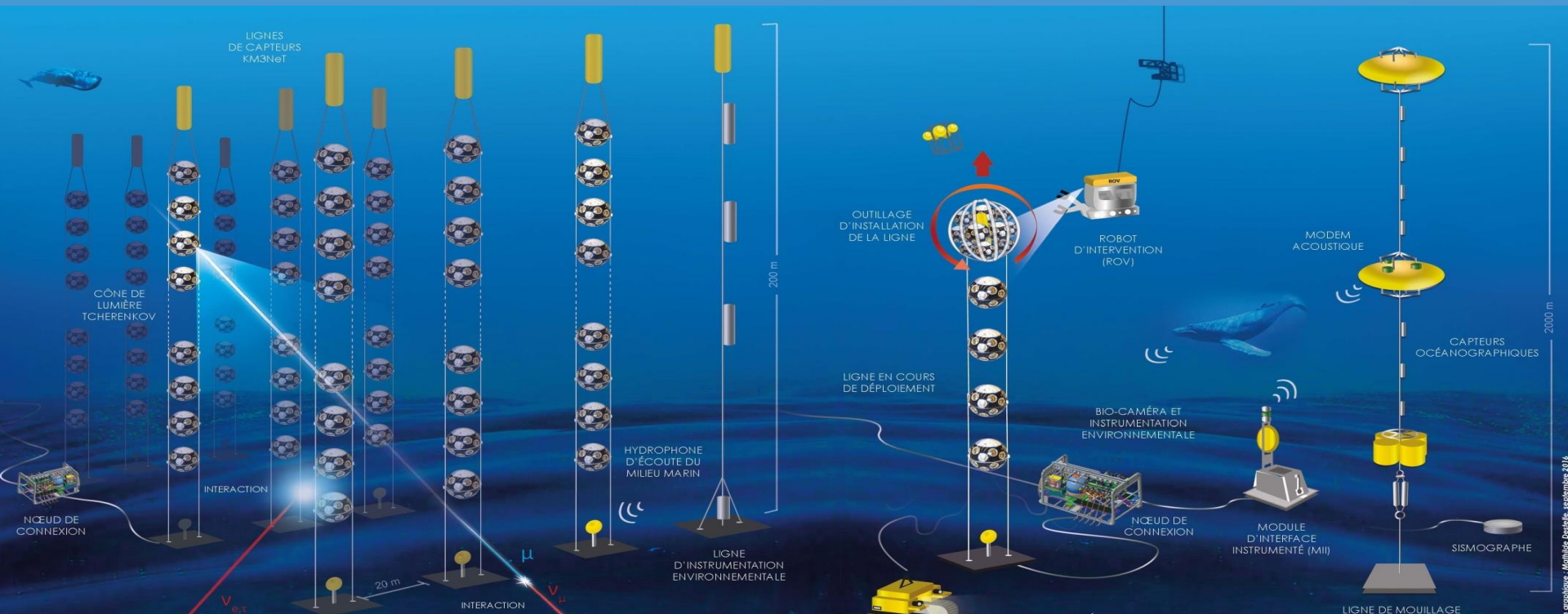
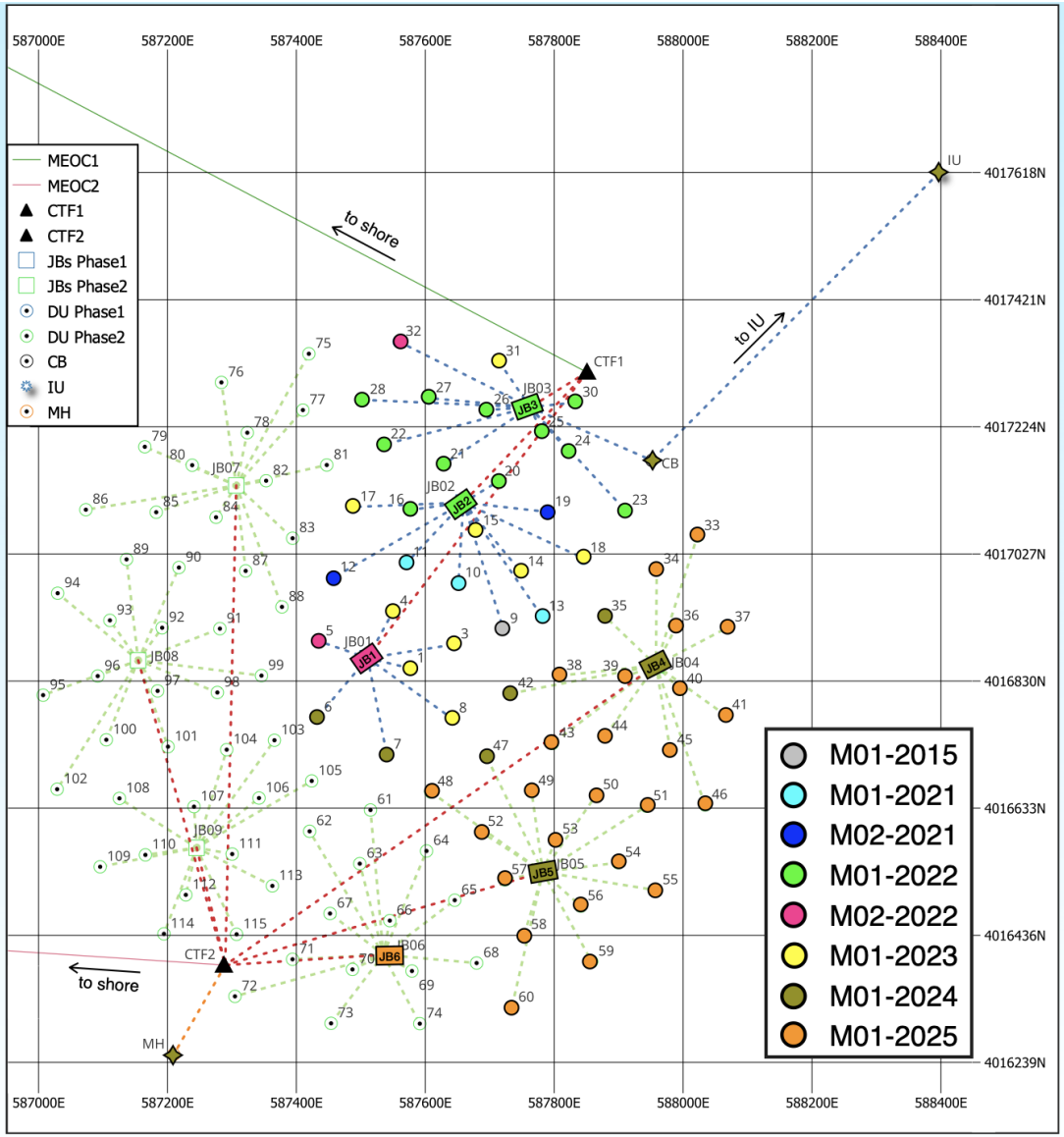
KM3NeT_IT_CT

Nunzio Randazzo - INFN Catania



Vue d'artiste du réseau de lignes de détection
Installé à 2500 m de profondeur



M01-2025

Goal: JULY 2025

- CTF1 inspection and test
- Deploy 25 DUs to JB4 and JB5
- Deploy JB6 (priority to be defined)
- Positioning: WIP to define timing and goal
- Recovery ARCA.0031 (low priority)

- In contact with vessel, crew, ROV. Contract under definition, goal is to book for July 2025 entire month
- Budget limited, prioritization of the activities to be defined
- Given the non-working Phase-1, deployment of WWRS DUs must be set in high priority!

KM3NeT_INFNCT – within the KM3NeT arganization framework

(Riccardo becomes Software/Computing Coordinator)

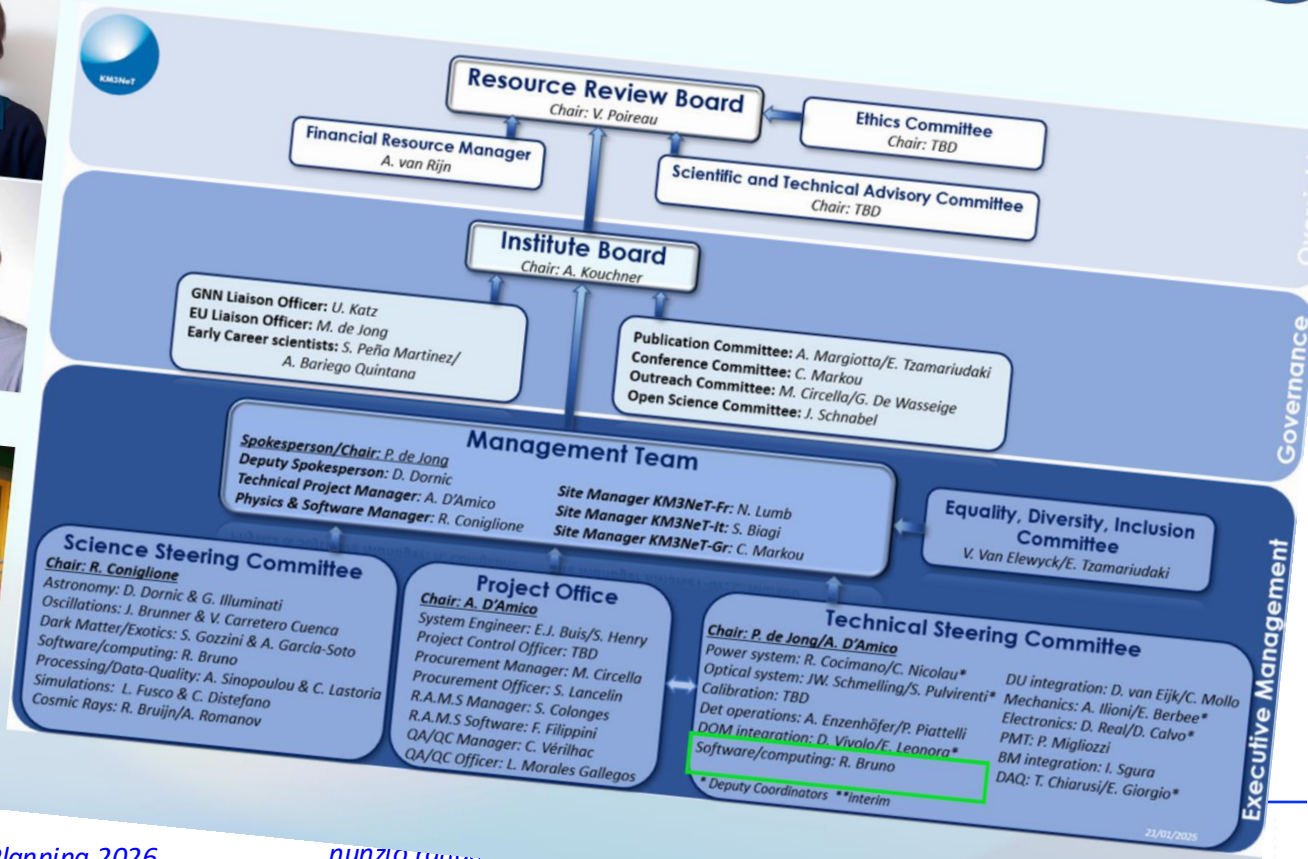
Technical Steering Committee

Software & Computing

- Mieke Bouwhuis (Nikhef) & Antonin Vacheret (IN2P3-Caen) left (Oct. 24)

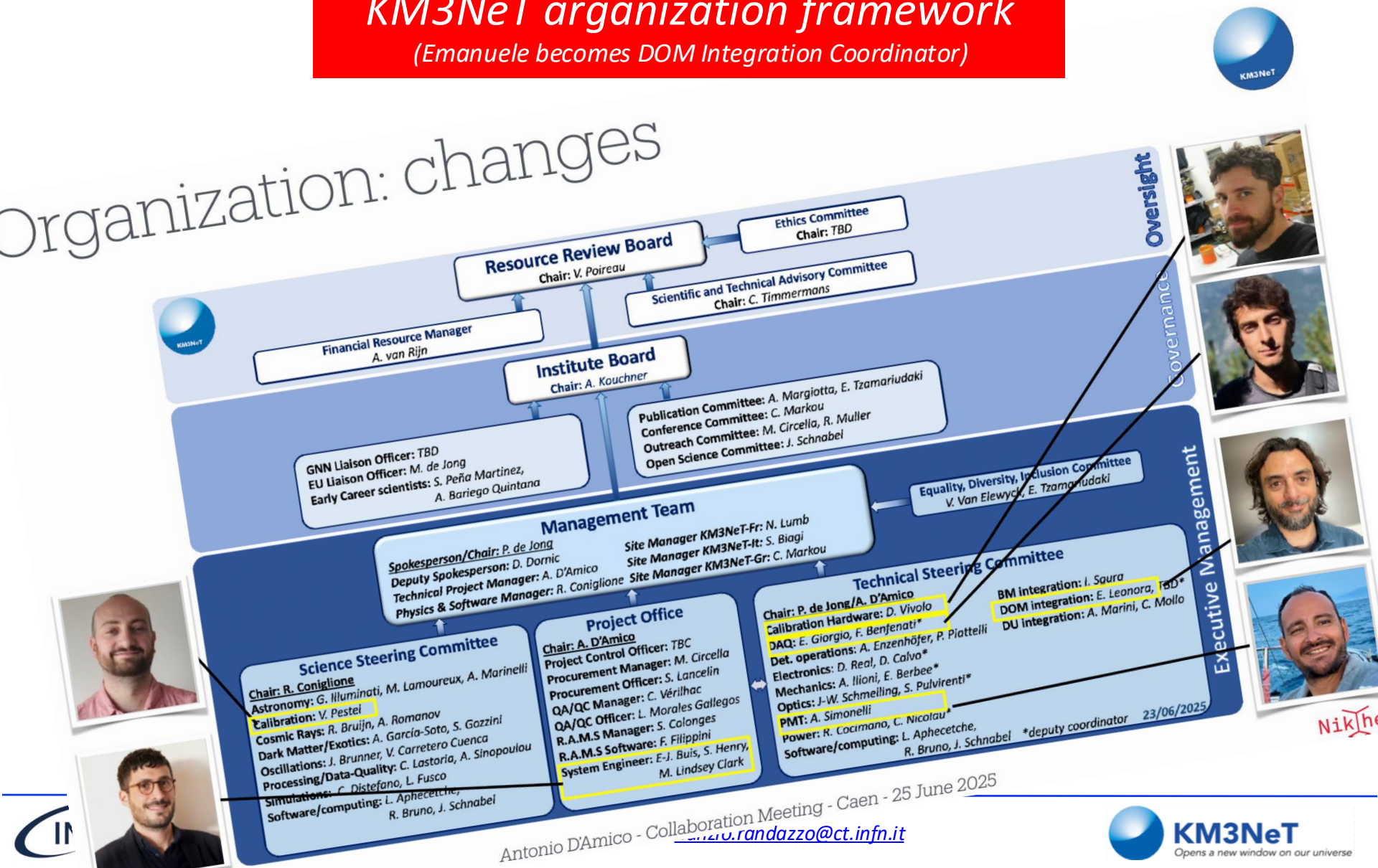
- **Riccardo Bruno** (INFN-Catania). becomes **Coordinator**

- **Deputy Coordinator is Needed** ⚠



KM3NeT_INFNCT – within the KM3NeT organization framework

(Emanuele becomes DOM Integration Coordinator)



[illegible].randazzo@ct.infn.it

KM3NeT_INFNCT – within the INFNCT arganization framework

(Fabio becomes responsible of "Servizio Tecnologie Avanzate " INFNCT)

A new face…. is on the way!!

KM3NeT_ IT_CT – Ladies …

Anna …back home!!

KM3NeT_ IT_CT – …and Gentlemen

KM3NeT_ IT_CT - Main Roles in the KM3NeT Project

- DOM integration Coordinator: Emanuele Leonora
- Catania DOM integration Site Responsible. E. Leonora
- Local Quality Supervisor: F. Longhitano

DOM Activities

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

Junction Box Activities

- Kme3net Computing/Software coordinator: R. Bruno
- Multimessanger Astronomy: Iara Tosta e Melo

Software e Data Analysis

Progress isn't possible without the essential work of our technicians.:

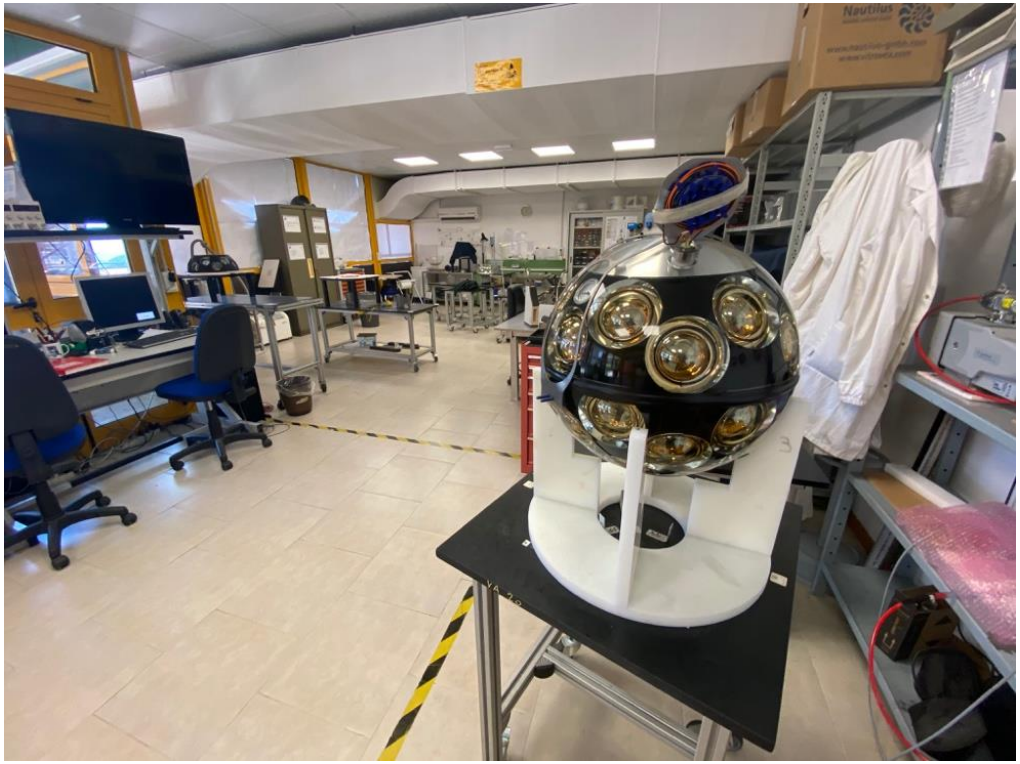
G. Imperiale 100% (PNRR)
E. Cafici 100% (PNRR)
G. Richichi 100% (PNRR)

Antonio Grimaldi
Domenico Sciliberto
Francesco Librizzi
Maurizio Salemi
Antonio Rapicavoli

Technical Activities

KM3NeT_IT_CT – DOM INTEGRATION SITE
Production till June 2025 - Expected 2026

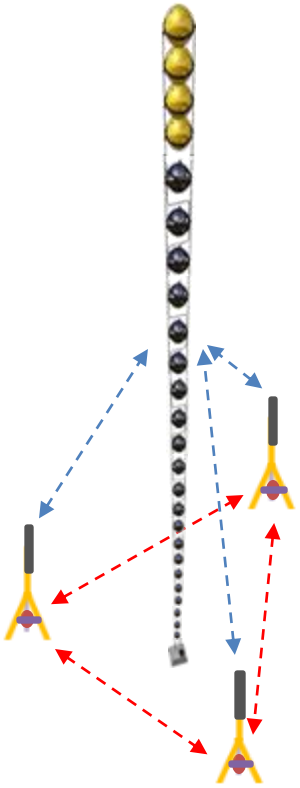
- Until June 2025 - **108 DOMs** has been produced in Catania and delivered always by the estimated time
- Thanks to all the technicians involved in DOM production we reached a rate of 3 DOMs at week
- **180 Expected in 2026**

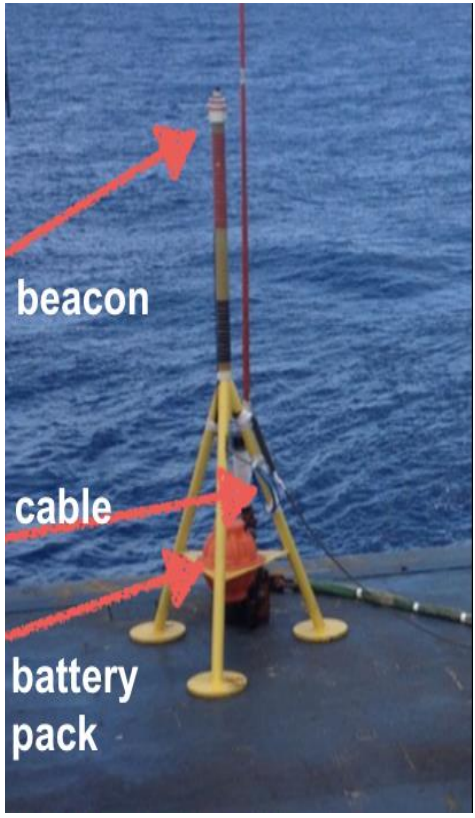


UPDATES ON DOM site activities: battery packs

n. 3 Battery Packs produced for the KM3Net acoustic positioning- May 2025

n. 3 battery packs will be done in 2026



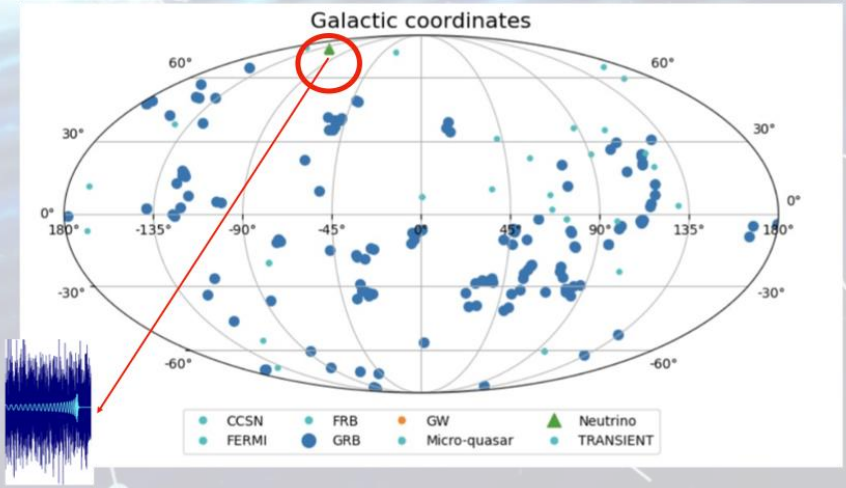


GWHEN analysis

Unmodelled Triggered analysis

GW coincidence related to the time and localization of HEN trigger

In short:
We take to sky position and time of the neutrino trigger and look if there was a GW signal in coincidence in the GW data

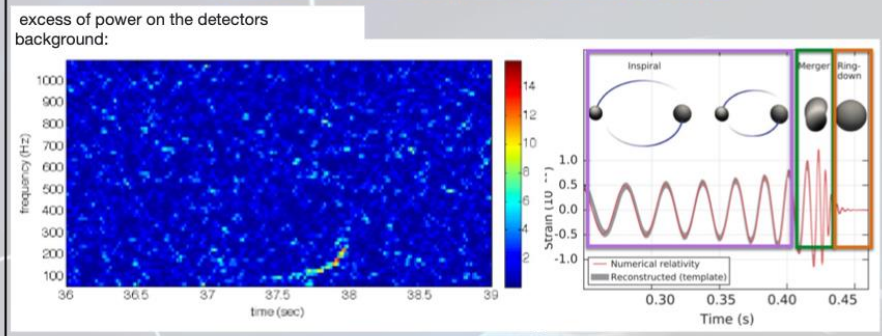


- For selection of the triggers, we based ourselves on the signalness computed for IceCube alert tracks and adapt it to KM3Net (ORCA6 and ANTARES here) data.

$$\text{Signalness}(E, X) = \frac{N_{\text{signal}}(E, X)}{N_{\text{signal}}(E, X) + N_{\text{background}}(E, X)}$$

HEN neutrino emissions in correspondence with GW in the GW data, waveforms must be injected to the data - WAVEFORMS BASED ON MODELS OF HEN EMISSION ALONGSIDE HEN

Modelled and unmodelled waveforms



Unmodelled waveforms = unmodelled searches

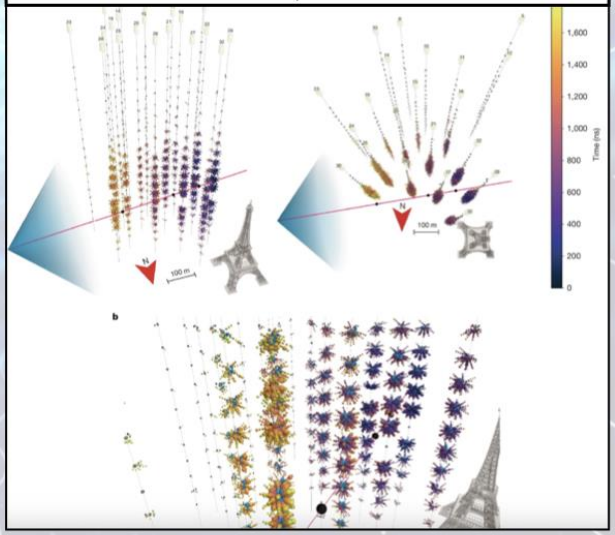
- More possibilities of models: stellar collapses, cusp, binary systems and NS instabilities
- Time window: -500;500 for Xpipeline

Analysis's ongoing and more detailed/results are about to be presented at ICRC

Expect result for triggered search: in case of non correlation, we we can estimate upper limits: the method uses a sample of GWs signals that were based on theoretical predictions.

Multimessenger Astronomy activities – Iara T.M.

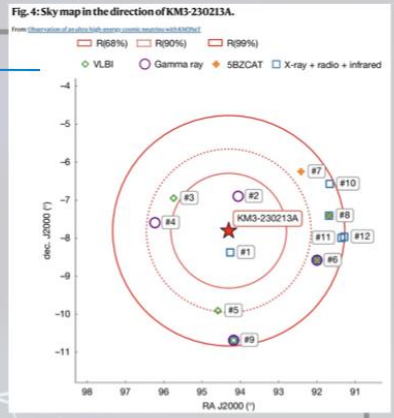
The KM3Net collaboration reported an exceptionally high-energy event observed by KM3NeT, the deep-sea neutrino telescope in the Mediterranean Sea, with the ARCA detector



- **Possible coincidence with Fermi/Swift GRB:**

Anything reported
Nearest IPN events were 230211A and 230215A, nearest Swift events were 230205A and 230216A, and nearest Fermi events were GRB230210260 and GRB230215612
Complementary info to the offline Fermi follow-ups

- **Possible coincidence Blazars, gamma and others**



- **Possible GW coincidence:**

No data for Virgo and LIGO detector in observation mode

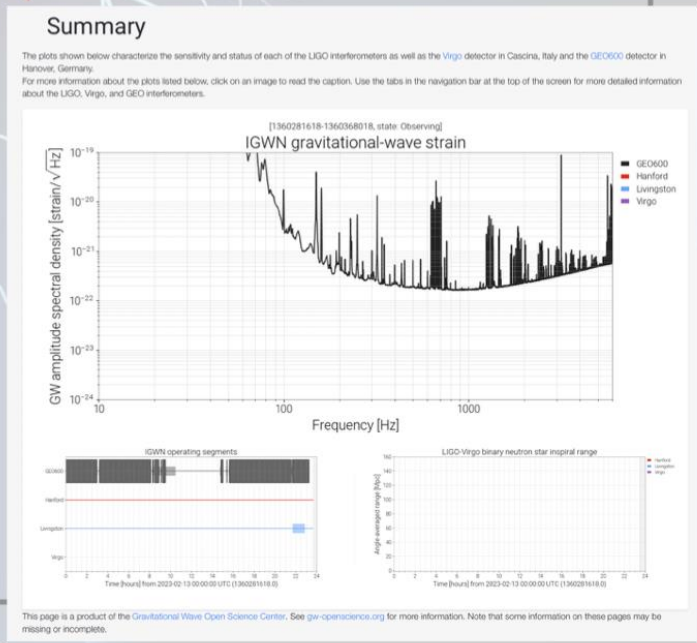
Data of GEO600 available

As no distance has been computed for KM3-230213 there is no limit imposed. GEO600 observation distance: 1.2 Mpc

- Perform a triggered analysis - single-detector search

We will be able to set a limit on GW emission but will not be able to declare a detection - **it will be the first study relating GW and HEN for this energy**

A new analysis is being set up which will have to include models for simulated signals. The sources are distributed uniformly in distance between 0.1 Mpc and 3 Mpc



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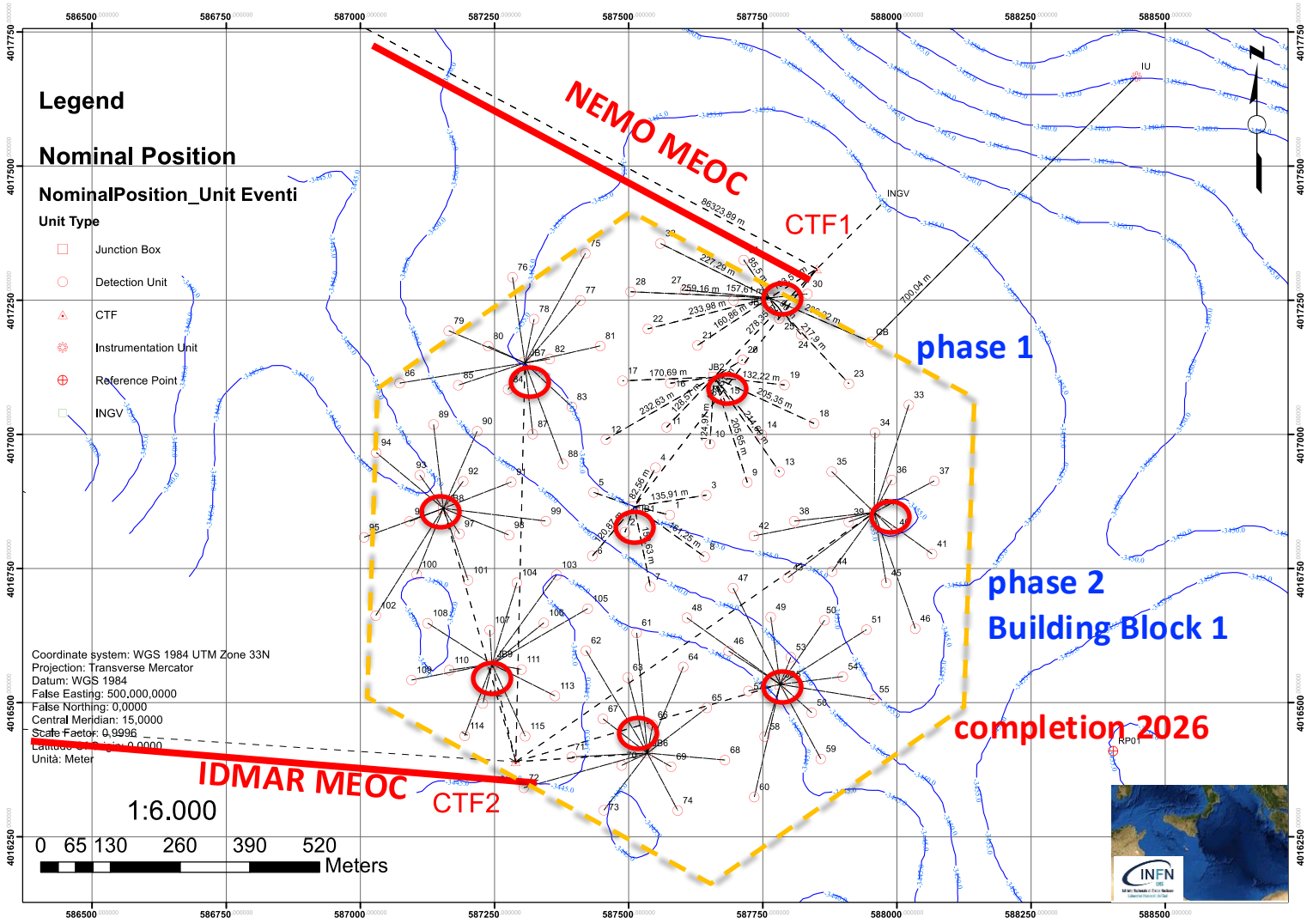
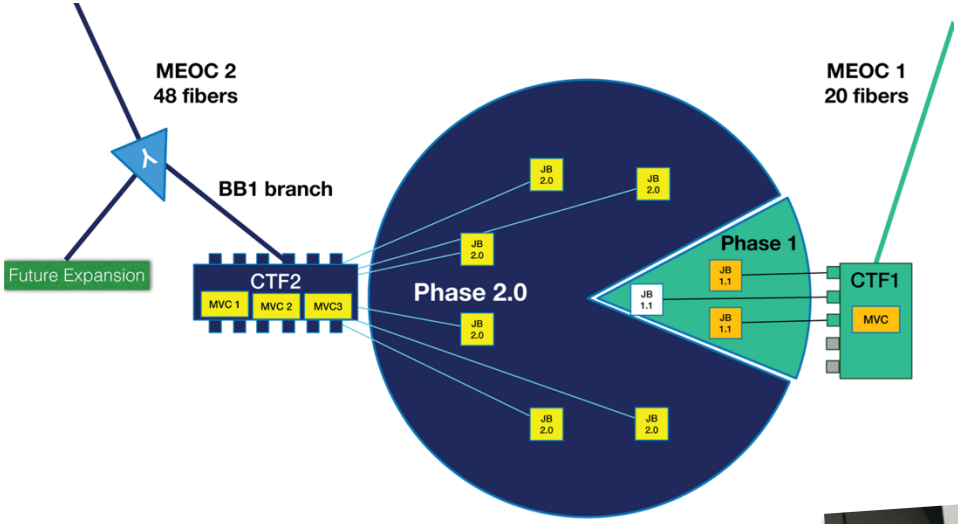
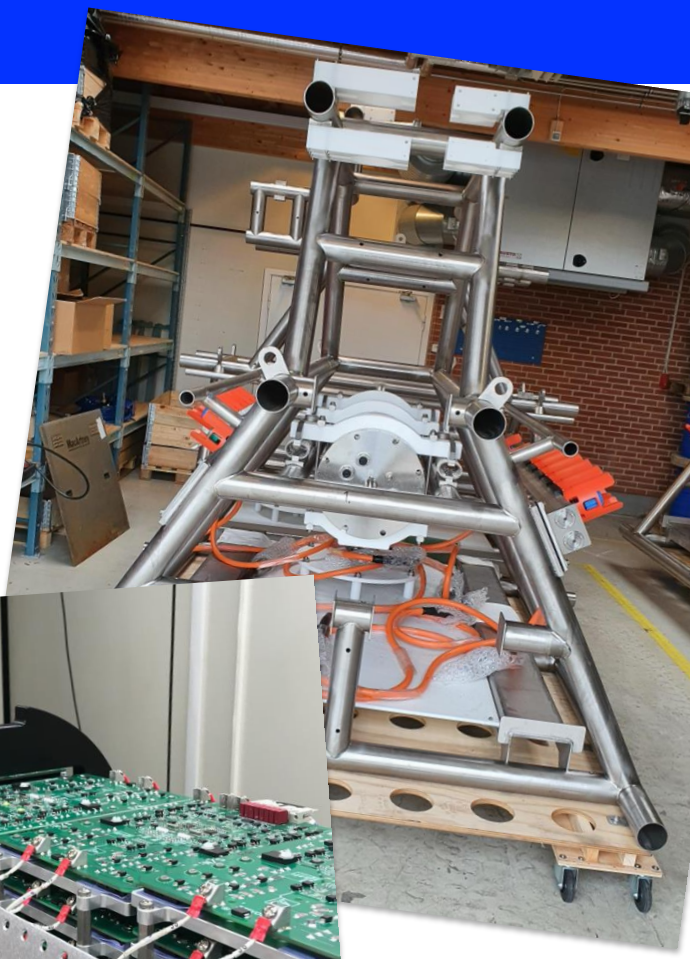
SEABED NETWORK

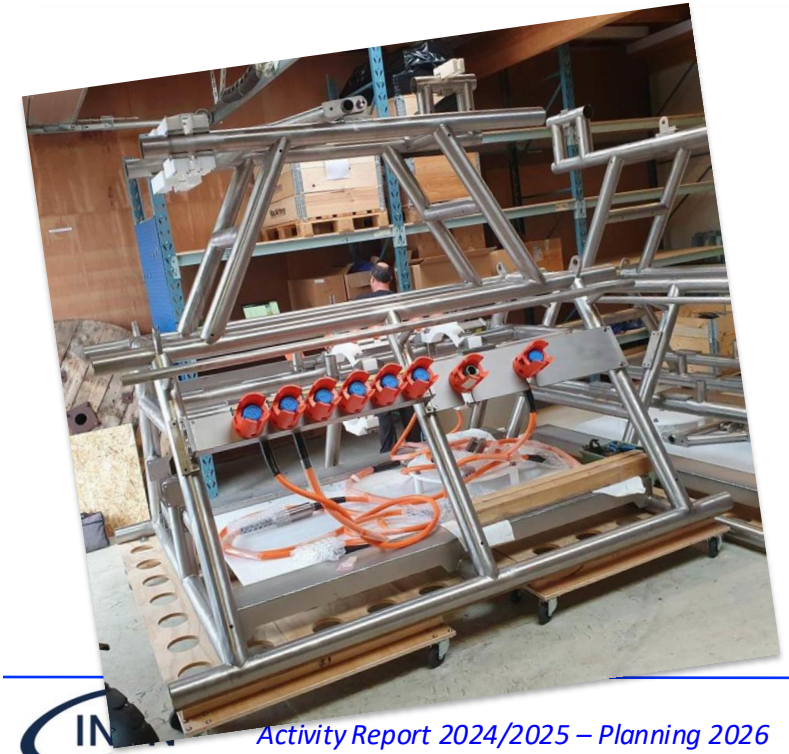


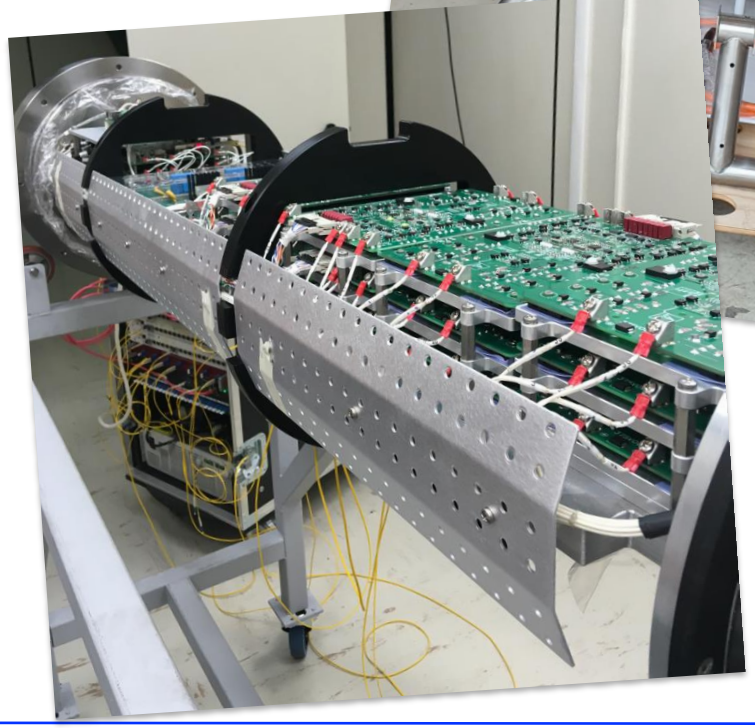
nunzio.randazzo@ct.infn.it

KM3NeT_IT_CT – JB development activities





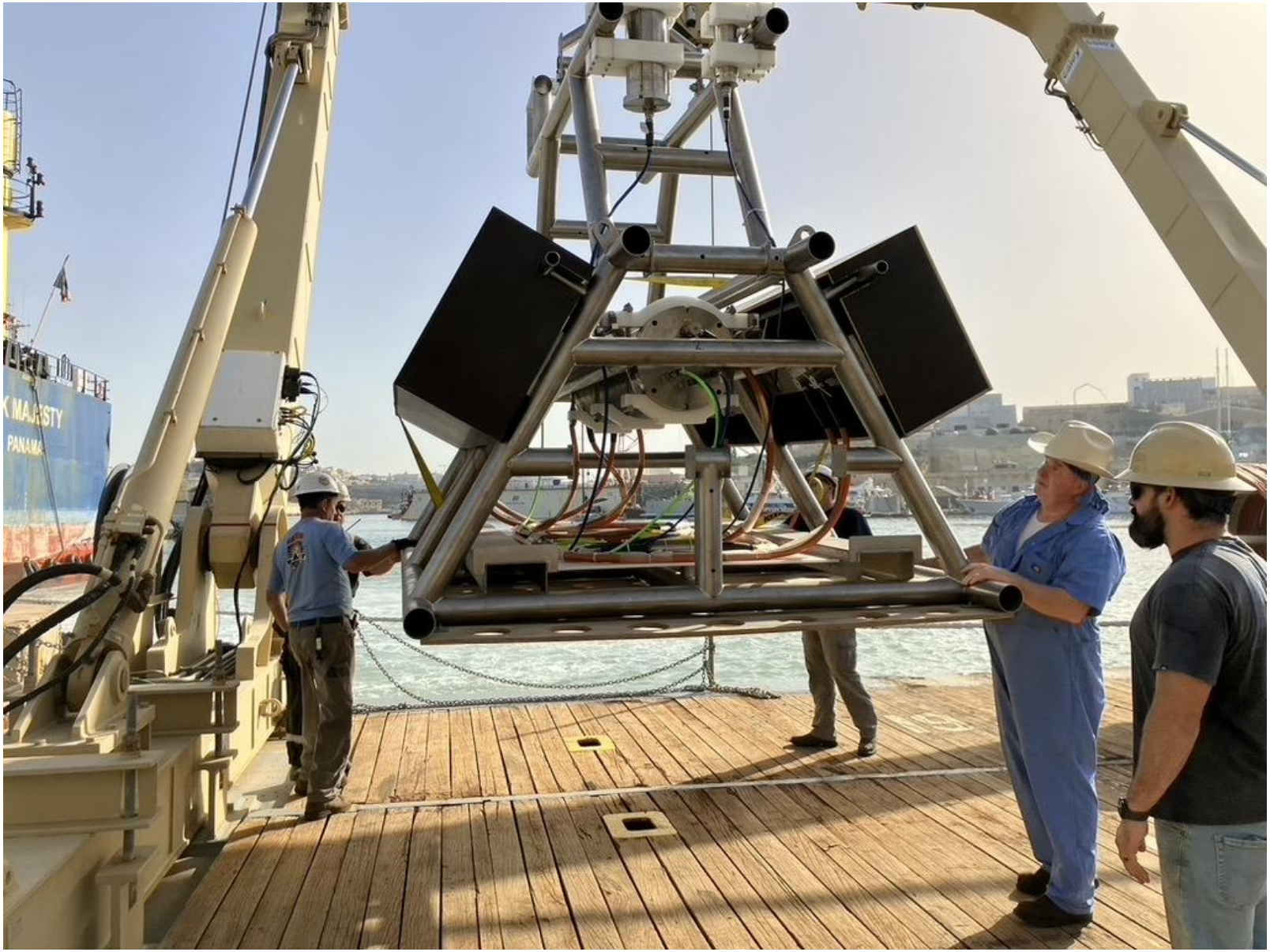




Production of JB2.0 SN-04 & 05 — Deployed in Sept 2024

Production of JB2.0 SN-04-05 — Harbor of Malta - Ready to board

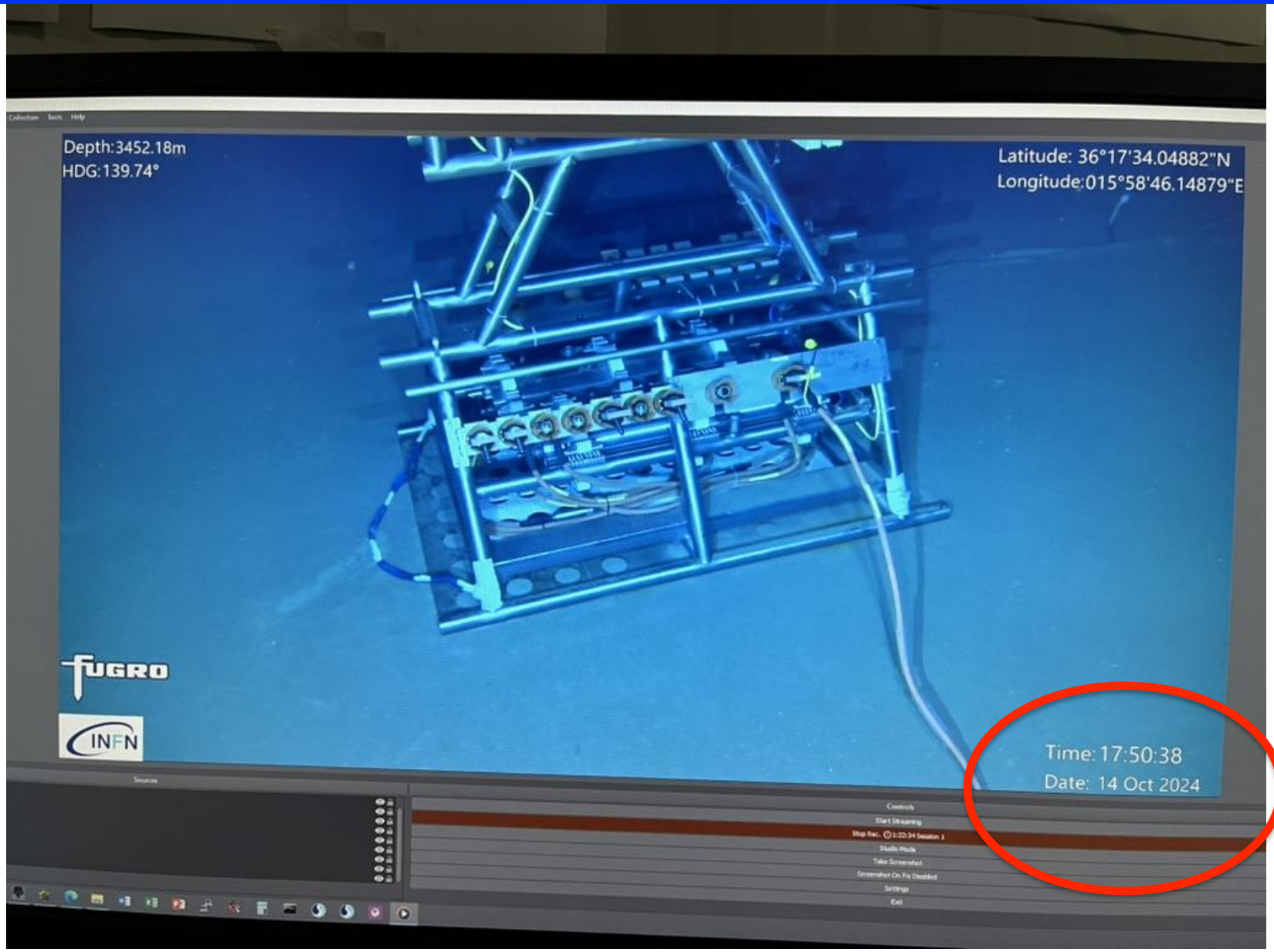
Production of JB2.0 SN-04-05 - On board - Ready to deploy @ 3400 mt depth



Production of JB2.0 SN-04-05 - On board - Ready to deploy @ 3400 mt depth

Production of JB2.0 SN-04-05 - On board - Ready to deploy @ 3400 mt depth

Production of JB2.0 SN-04-05— Nominal and working well on seabed



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

KM3NeT_ IT_CT– Planned Activities 2026

- **DOM production**
  - to be continued (180 DOM)

- **Activities on KM3NeT-IT Site**
  - Project management production # 6 - JB 2.0 (2 already integrated – 4 to be integrated within 2026) - Budget 7,5 M€

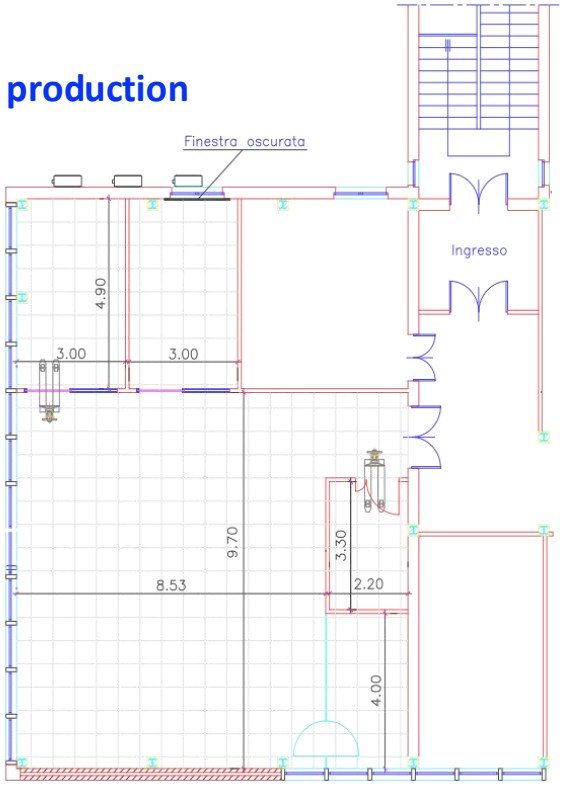
- **Marine campaigns**
  - Survey/maintenance of the Seabed network
  - Multiple deployment of JBs/DUs

- **Outreach**
  - …as usual

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 incerasse the rate of the production

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



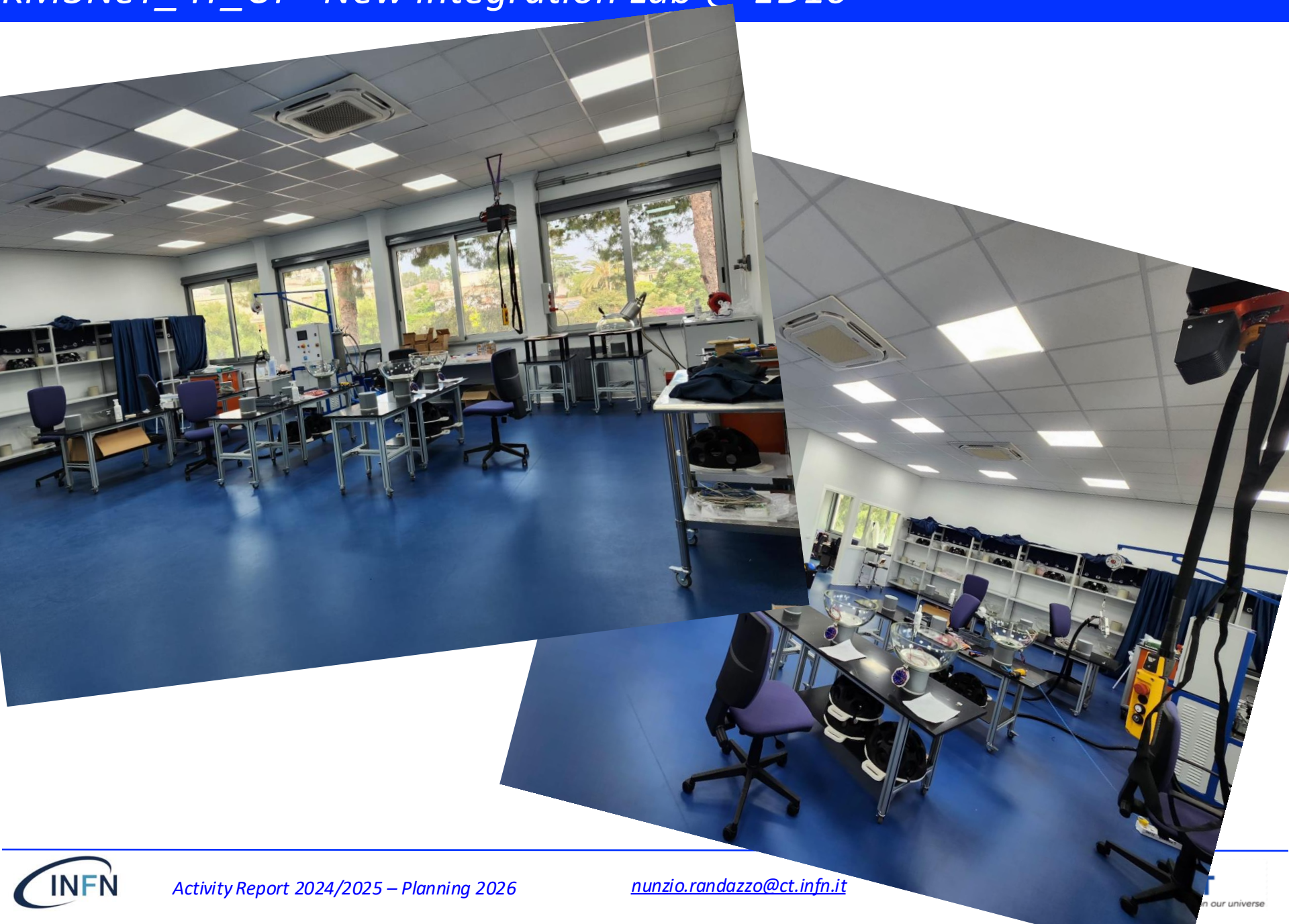
Procedures under going for purchasing tools and machines
2 procedures under going for construction works in the second DOM integration site

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

KM3NeT_ IT_CT– New integration Lab @ ED10

nunzio.randazzo@ct.infn.it

KM3NeT_ IT_CT– New integration Lab @ ED10



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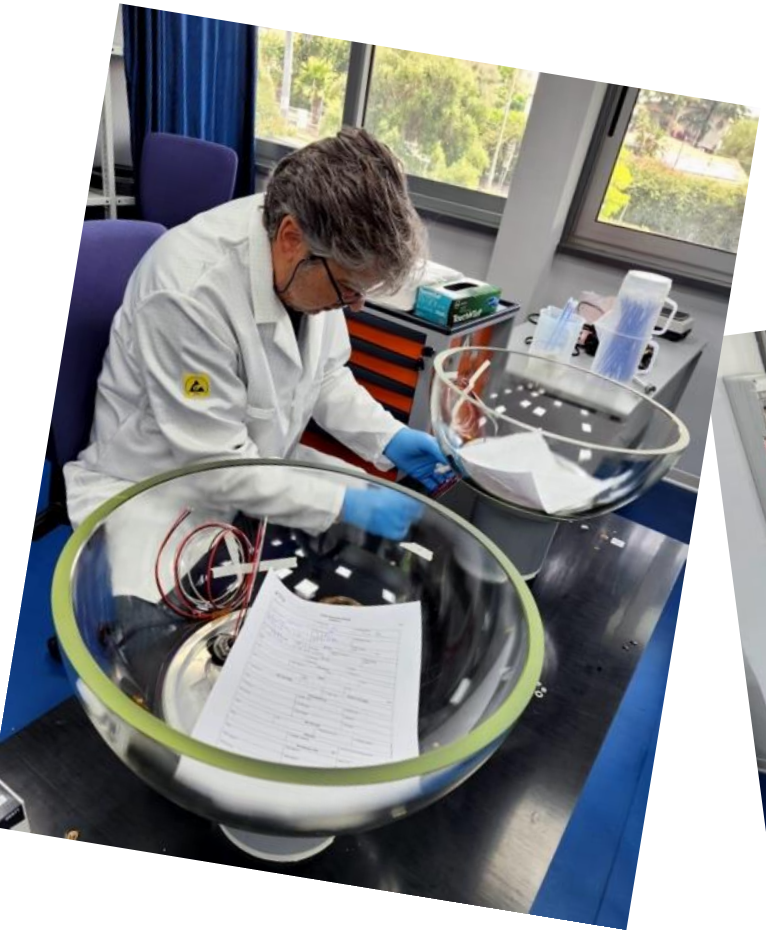
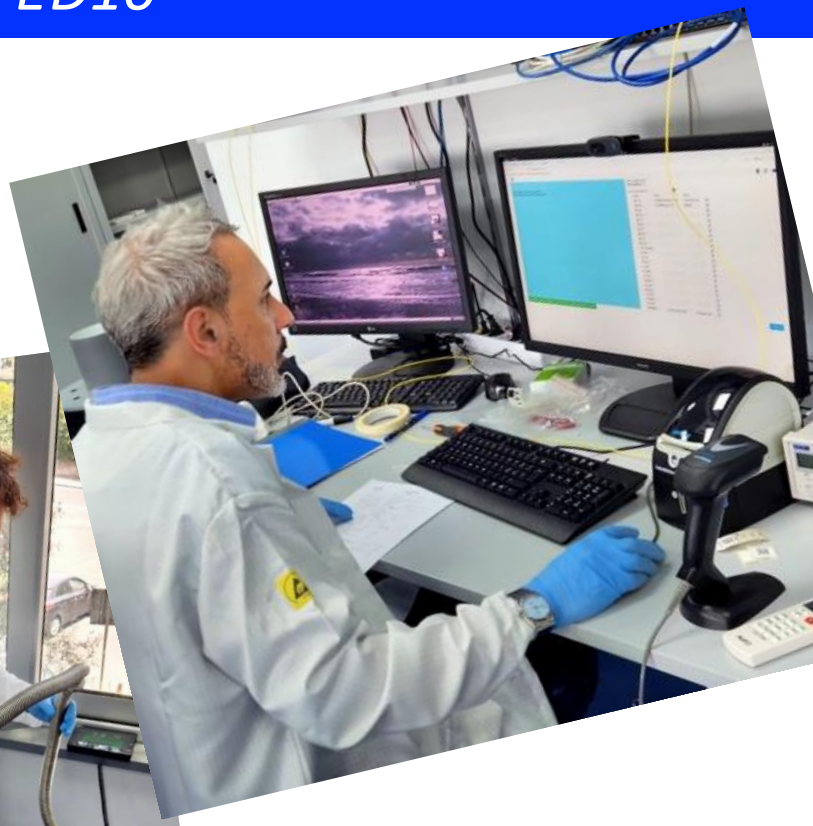
KM3NeT_ IT_CT– New integration Lab @ ED10





KM3NeT_ IT_CT – Outreach activities

KM3NeT_ IT_CT – Outreach activities

- 28 maggio 2025 c/o INFN – sez. di Catania. I.I.S. In visita “E. Medi - N. Vaccalluzzo” di Leonforte (EN) - 40 studenti.
- 8 maggio 2025 c/o I.I.S. "Concetto Marchesi" di Mascalucia (CT) - circa 40 studenti.
- 29 aprile 2025 c/o Convitto Nazionale Mario Cutelli di Catania (CT) - oltre 100 studenti.
- 2 aprile 2025 c/o INFN – sez. di Catania. In visita Liceo Majorana di Scordia (CT) - 90 studenti.
- 28 marzo 2025 c/o INFN – sez. di Catania. In visita ISISS Antonio Scarpa di Motta di Livenza (TV) - 70 studenti.
- 5 marzo 2025 c/o INFN – sez. di Catania. Seminario Studenti IV anno Liceo Classico N. Spedalieri Catania.
- 12 febbraio 2025 c/o INFN – sez. Catania. KM3NeT annuncia una nuova scoperta sui neutrini cosmici.
- 26 novembre 2024 c/o INFN – sez. di Catania. International Cosmic Day 2024 - oltre 100 studenti.
- 27 settembre 2024 c/o Cortile Platamone, Catania. SHARPER Night 2024 – centinaia di persone
- 26 maggio 2024 c/o Città della Scienza, Catania. Giornata Europea del Mare - centinaia di persone

KM3NeT_ IT_CT– People & Financial request 2025

- **People**

Nunzio Randazzo	70 % (Dirigente Tecnologo -RL)
Emanuele Leonora	100% (Primo Tecnologo)
Fabio Longhitano	30% (Tecnologo)
Riccardo Bruno	100% (Tecnologo)
Mariangela Bondì	20% (Tecnologo)
Iara Tosta e Melo	Formally 0 % (RTDA -PNRR)
	3,2 FTE

Technicians request to «Servizio Tecnologie Avanzate»

20 MU

- **Financial request**
  - travelling 101 k€
  - Lab DOM consumable 20 k€
  - DOM transportation to DU integration site about 28 k€