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COST ACTION CA24131

European Network for radiation-detection based Research and  
Innovation addressing increasing societal CHallenges (ENRICH)

ENRICH

WG2 Report:

Technological Advancement



Department of Physics and Chemistry  
(DiFC) Emilio Segrè University of  
Palermo, Italy

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F. Principato; S. Vitellaro; V. Taormina



## Main Research Activities

- Room temperature semiconductor detectors for X-ray and gamma ray spectroscopy and imaging (1 keV-1 MeV).
- Analog front-end electronics and digital pulse processing techniques for performance enhancements.
- Detection systems for medical, astrophysical, nuclear and food applications.

WG2 focuses on all activities allowing for technological advancements .....

- Radiation detection

- Radiation source

120 participants!

### WG2 Leader

Prof Leonardo ABBENE ^

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### WG2 Co-Leader

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WG2 is organized in **4 Tasks**, addressing Research Coordination Objectives (RCOs) and Technological Efforts (TEs)

## Tasks

**T2.1:** Conduct a comprehensive survey of existing photon detection techniques, focusing on energy, position, and timing resolution capabilities (**RCO2: Research Coordination Objective 2**).

**RCO2:** Survey the globally most widely used photon detection techniques, identifying their strengths, weaknesses, and potentials for improvement based on interest range, energy, resolutions and counting capabilities.

**T2.2:** Stimulate the investigation in new materials and detector configurations to enhance photon detection performances (energy, time and spatial resolution) and to develop a new generation of optical components while reducing costs.

**TE1 (Technological Effort):** Reduce the gap between energy resolution, efficiency, and cost for radiation detectors by exploring new materials for photon detection, configurations, and readout techniques.

**TE2:** Enhance Research & Development (R&D) for photon detectors with high energy, space and time resolution at room or non-cryogenic temperatures.

**TE3:** Develop more efficient and cost-effective optics through new manufacturing processes and materials.

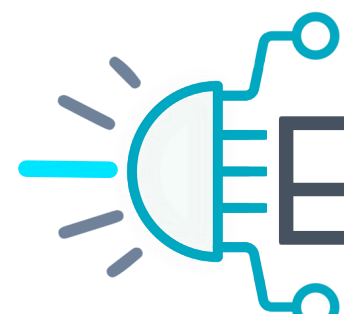
**T2.3:** Connect research teams and producers to allow for a more massive production of the new technological outcomes produced by the ENRICH Action, aiming reduction of the production costs

**RCO3:** Create a collection of private enterprises, including manufacturers and other stakeholders, to facilitate collaboration on market applications, new tools for data acquisition and analysis, and user-friendly software development.

**RCO4:** Promote knowledge exchange among Monte Carlo simulation communities, integrating ray tracing software with other physics simulations (e.g., GEANT4, FLUKA).

**T2.4:** Create a stronger collaboration between research teams and producers to identify the present weak points in table-top photon sources.

**TE4:** Improve the brilliance and power of lab-based photon sources like X-ray tubes.



# ENRICH

## Planned Timeline: first year

| WG / Tasks                                   | Q1 | Q2 | Q3 | Q4 |
|----------------------------------------------|----|----|----|----|
| <b>WG1: Cost Management and Coordination</b> |    |    |    |    |
| T1.1                                         |    |    |    |    |
| T1.2                                         |    |    |    |    |
| T1.3                                         |    |    |    |    |
| <b>WG2: Technological Advancements</b>       |    |    |    |    |
| T2.1                                         |    |    |    |    |
| T2.2                                         |    |    |    |    |
| T2.3                                         |    |    |    |    |
| T2.4                                         |    |    |    |    |
| <b>WG3: Software Advancements</b>            |    |    |    |    |
| T3.1                                         |    |    |    |    |
| T3.2                                         |    |    |    |    |

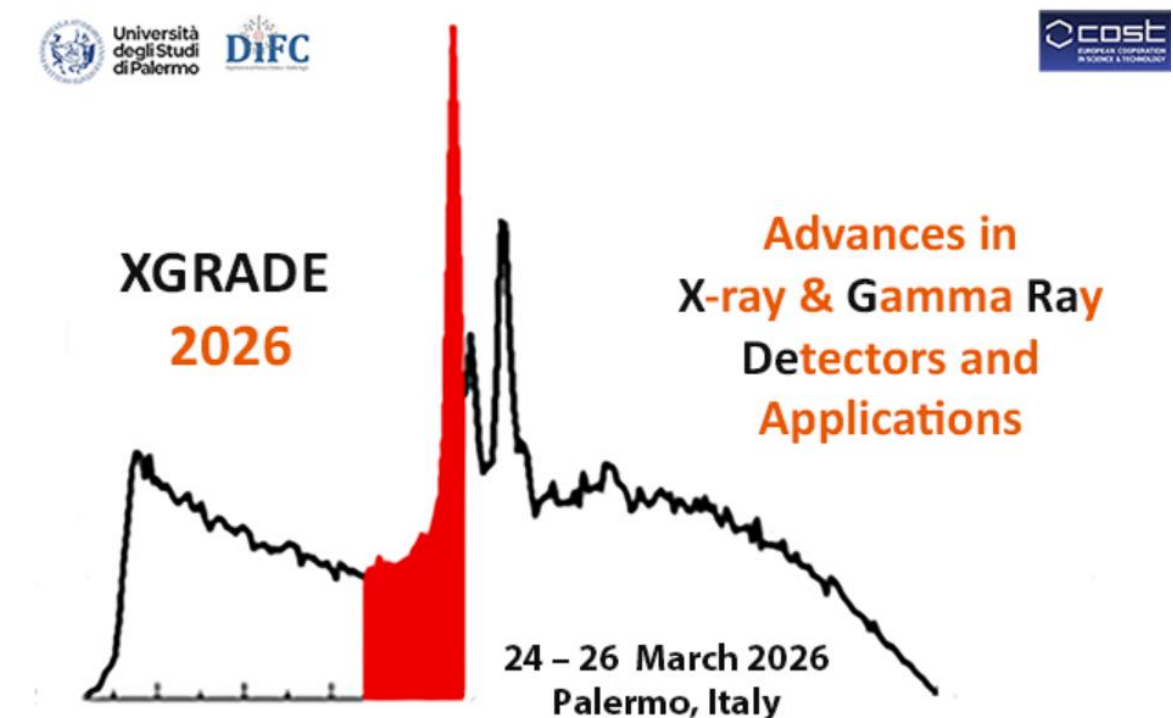
## 1<sup>st</sup> WG2 Meeting, 5 February 2026 (online)

General introduction to the COST Action and presentation of the tasks of the WG2 with the related Research Coordination Objectives (RCOs) and Technological Efforts (TEs).

Presentation of the expertise and research activities of WG2 leaders.

Presentation of the first edition of “Advances in X-ray and Gamma Ray DEtectors and applications (XGRADE)” workshop that will be held at University of Palermo, Italy on 24-26 march 2026. XGRADE2026 is the first event organized in the framework of the COST Action CA24131-ENRICH.

## XGRADE conference, 24-26 march 2026, Palermo, Italy

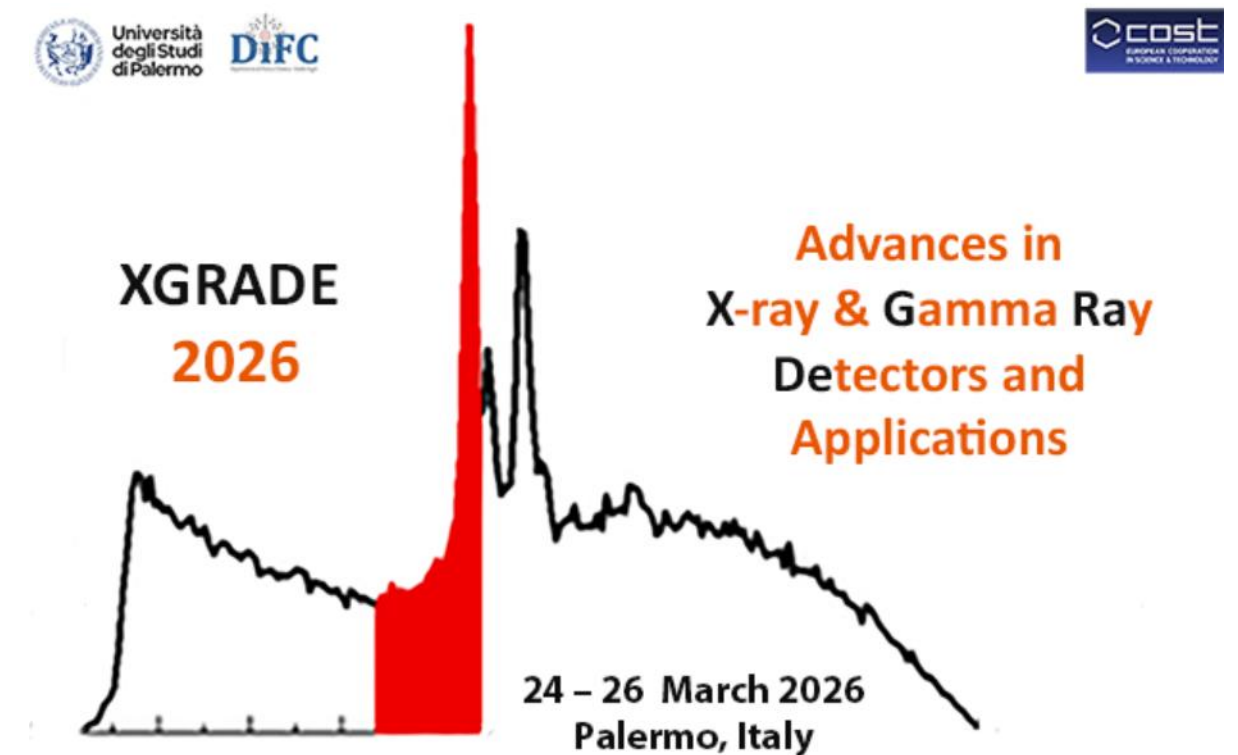


**XGRADE 2026** was the first event organized in the framework of the COST Action CA24131-ENRICH.

The main goal of **XGRADE2026** workshop was to provide a forum for discussion of the state of the art for X-ray and gamma ray detector technology, including materials improvement, device development and characterization, electronic readout, signal processing, system development and applications.

Stimulating new ideas and collaborations among researchers working on radiation detectors and imagers for X-ray and gamma ray measurements.

**46 Participants, 32 Talks (30 minutes) and 10 Travel Grants for young researchers**

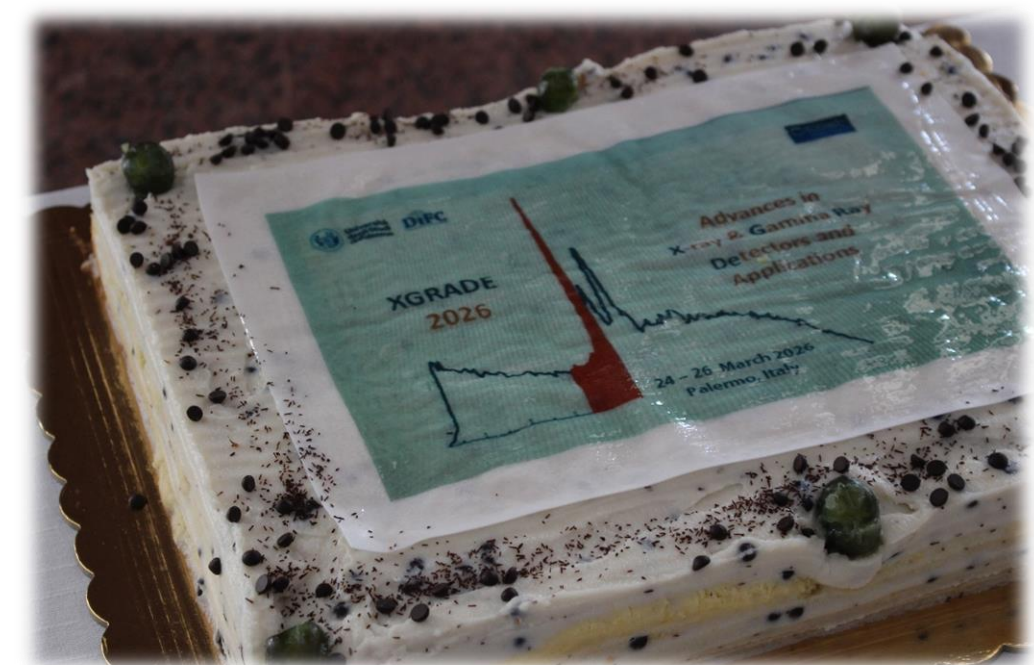


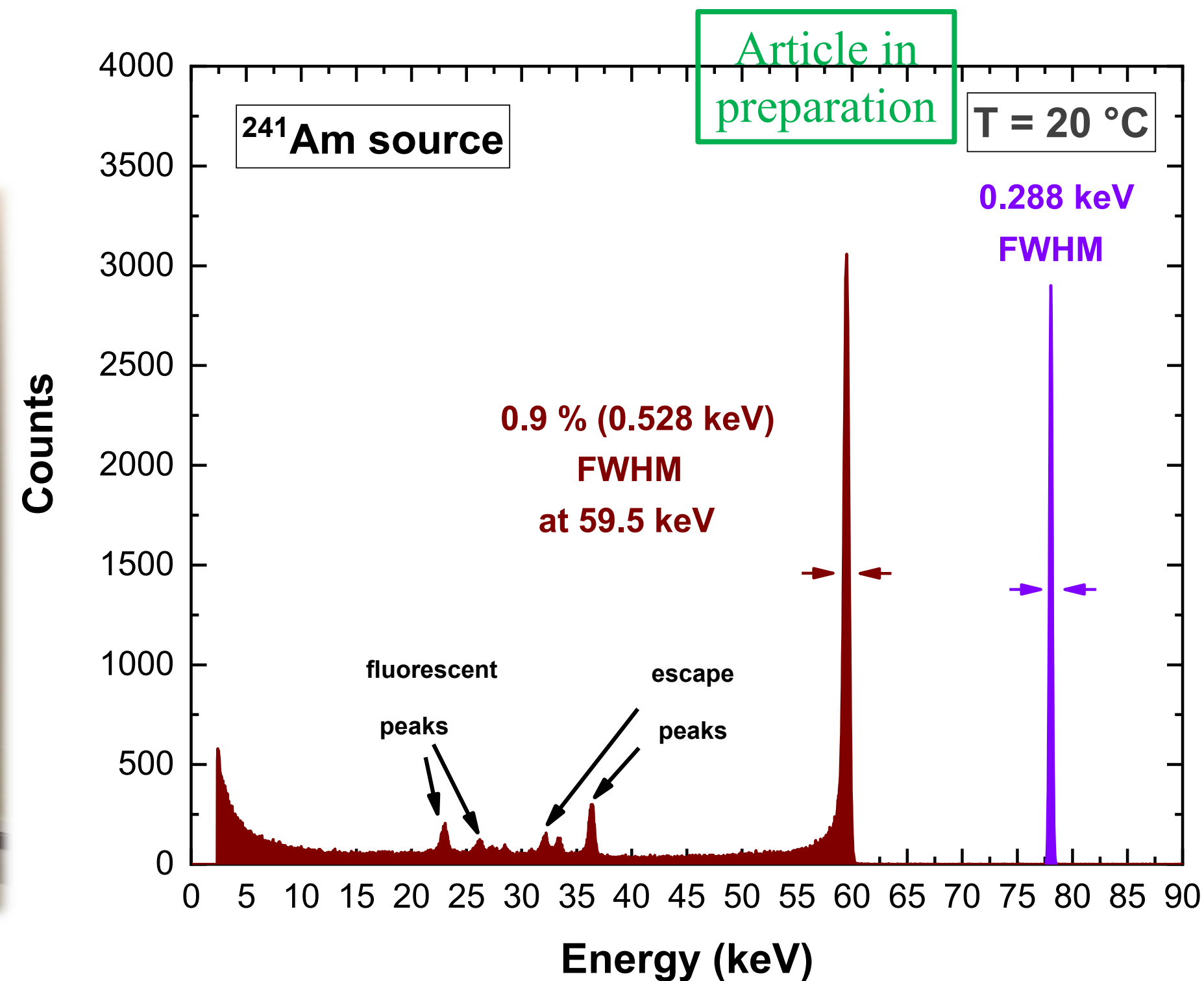
### Conference Chairs

- Leonardo Abbene, Department of Physics and Chemistry (DiFC) -Emilio Segrè, University of Palermo, Palermo, Italy (Chair)
- Antonino Buttacavoli, Department of Physics and Chemistry (DiFC) -Emilio Segrè, University of Palermo, Palermo, Italy (Co-Chair)
- Jesiel Patel, University of Strathclyde, Glasgow, UK (Co-Chair)
- Alessandro Scordo, Laboratori Nazionali di Frascati INFN, Italy (Co-Chair)

The program included four main sessions:

- **Detectors** (room temperature semiconductor detectors, silicon and germanium, gas detectors and scintillators): T2.1, RCO2, T2.2, TE1, TE2
- **Applications** (medicine, astrophysics, nuclear, food industry, laser driven X-ray sources, plasma sources): TE3, T2.3, T2.4, TE4
- **Electronics and Pulse Processing** (digital pulse processing and analog low noise preamplifiers): T2.1, RCO2, T2.2, TE1, TE2
- **Data Analysis and Machine Learning** (simulation of detectors and performance improvements): T2.1, RCO2, T2.2, TE1, TE2, RCO3, RCO4





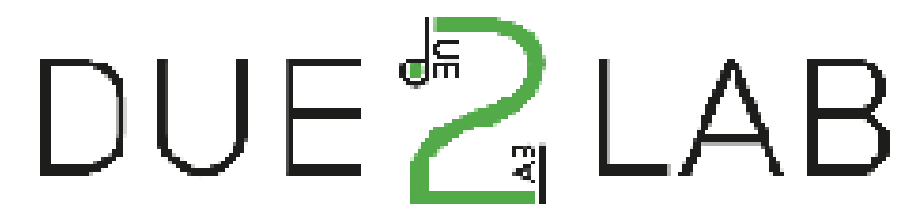
Andrea Zappettini, IMEM-CNR, Parma, Italy

**the best energy resolution with CZT detectors**



**Best Young Researcher Talk Award**  
José Sousa, Université Paris-Saclay,  
CEA IRFU, France.

“ CadTool- a end-to-end x-ray/gamma-ray solid state detector simulation framework”.



# KETEK



| WG / Tasks                            | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 |
|---------------------------------------|----|----|----|----|----|----|----|----|
| WG1: Cost Management and Coordination |    |    |    |    |    |    |    |    |
| T1.1                                  |    |    |    |    |    |    |    |    |
| T1.2                                  |    |    |    |    |    |    |    |    |
| T1.3                                  |    |    |    |    |    |    |    |    |
| WG2: Technological Advancements       |    |    |    |    |    |    |    |    |
| T2.1                                  |    |    |    |    |    |    |    |    |
| T2.2                                  |    |    |    |    |    |    |    |    |
| T2.3                                  |    |    |    |    |    |    |    |    |
| T2.4                                  |    |    |    |    |    |    |    |    |
| WG3: Software Advancements            |    |    |    |    |    |    |    |    |
| T3.1                                  |    |    |    |    |    |    |    |    |
| T3.2                                  |    |    |    |    |    |    |    |    |
| T3.3                                  |    |    |    |    |    |    |    |    |
| T3.4                                  |    |    |    |    |    |    |    |    |
| WG4: Electronics and DAQ              |    |    |    |    |    |    |    |    |
| T4.1                                  |    |    |    |    |    |    |    |    |
| T4.2                                  |    |    |    |    |    |    |    |    |



International Workshop  
**28th iWoRiD**  
on Radiation Imaging Detectors

27 June–1 July  
2027

 Università  
degli Studi  
di Palermo

Dipartimento di  
Fisica e Chimica  
“Emilio Segrè” 

**Palermo, ITALY**

## Excursion

Boat trip near the beaches of Favignana island with drinks and light dinner.



## Local Organizing Committee



Leonardo Abbene,  
University of Palermo, Italy,  
Chair



Antonino Buttacavoli,  
University of Palermo,  
Italy



Fabio Principato,  
University of Palermo,  
Italy



Giuseppe Bertuccio,  
Politecnico di Milano,  
Italy



Filippo Mele, Politecnico  
di Milano, Italy



Andrea Zappettini,  
IMEM-CNR Parma, Italy



Alessandro Scordo,  
LNF-INFN, Italy



Eugenia Naselli, LNS-  
INFN, Italy



David Mascali,  
LNS-INFN, Italy

## Acknowledgements

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COST (European Cooperation in Science and Technology) is a funding agency for research and innovation networks. Our Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation.

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