CPAN Network on Instrumentation and Detectors (CNID)

Análisis Estratégico CNID

- Qué es?
- Por qué hacerlo?
- Cómo hacerlo?

César Domingo, CNID @ CPAN Days, Valencia 19-21 Noviembre 2025

Qué es el Análisis Estratégico CNID

TASK 1.5 Strategic analysis and resource optimization: Conduct a comprehensive analysis of R&D activities related to particle, astroparticle, and nuclear physics instrumentation in Spain. Assessing the expertise available, identifying existing infrastructures, evaluating current technological capabilities, and mapping out potential areas for collaboration and resource optimization. Insights gained from this analysis inform strategic planning, ensuring alignment with national and international research priorities. **Deliverable:** Comprehensive intermediate and final reports on R&D topics outlining priorities, propose new methodologies or technologies, highlight challenges, and recommend strategies.

 Análisis, compilación, … **documento (white paper)** con todas nuestras capacidades y especialidades en los grupos de la red, para desarrollar instrumentación y detectores, cubriendo transversalmente todos los ámbitos de instrumentación y detectores relacionados con física de partículas, astropartículas y nuclear.

Por qué hacer un Análisis Estratégico CNID

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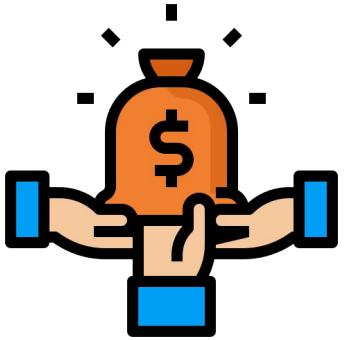
- Documento de presentación (whitebook) para acceder a **financiación**:

  AEI, CDTI, etc



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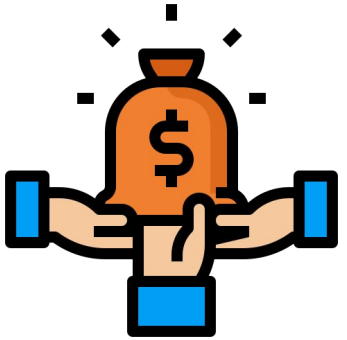
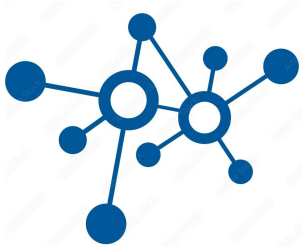


- Establecer conexiones y sinergias entre grupos CNID



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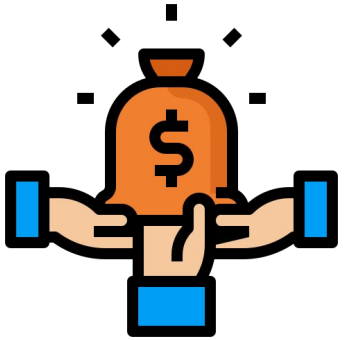

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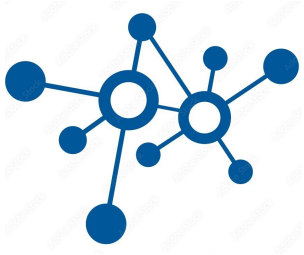

- Oportunidad única: primer documento de este estilo en España

Cómo contribuir al Análisis Estratégico CNID

CNID Strategic Planning
WGXX - Group Topic
Contributors (Conveners and groups)

1 Executive Summary (Recommended: one page maximum)

Provide a brief overview of the main findings and strategic recommendations from the group.

2 Findings (Recommended: two pages maximum)

2.1 Scientific and Technical Focus Areas

- Main technological domains and expertise of the participating groups (e.g., tracking detectors, calorimetry, timing, photon detection).
- Main R&D topics pursued by the participating groups (e.g., radiation-tolerant vertexing, 5D calorimetry).
- Main experiments (if any) targeted by the group's R&D (e.g., FCC, Belle-II, DUNE, n_TOF, ISOLDE, FAIR-NUSTAR, AGATA).

2.2 SWOT Analysis

- Identify *critical gaps*: Are there any missing skill or infrastructure that is essential to remain competitive and effectively contribute to national or international projects, and which currently cannot be covered by existing groups or facilities? (e.g., ASIC designer, FPGA programmers, high-energy test beam facilities).

Strengths	Weaknesses
• •	• •
Opportunities	**Threats**
• •	• •

WG 1 Gaseous Detectors: Yassid Ayyad (IGFAE) and Cristina Fernández (CIEMAT); effort to improve time and spatial resolution; develop large-area systems based on Micro-Pattern Gas Detectors.

WG 2 Liquid Detectors: Clara Cuesta (CIEMAT) and Justo Martín (IFIC) focus on enhancing readout technology for liquid detectors and reducing noise to lower signal energy thresholds.

WG 3 Solid State Detectors: Sebastian Grinstein (IFAE), Carlos Mariñas (IFIC), and Teresa Kurtukian (IEM) integrating sensing and microelectronics in monolithic CMOS sensors and 4D-capable sensors.

WG 4 Calorimetry: Mary-Cruz Fouz (CIEMAT) and Héctor Alvarez-Pol (IGFAE) develop radiation-hard calorimeters with enhanced electromagnetic energy and timing resolution.

WG 5 Quantum sensing: Gemma Rius (IMB-CNM) and Igor García Irastorza (UNIZAR) investigate quantum technologies for particle physics applications.

WG 6 Electronics, DAQ and Trigger: Santiago Folgueras (UNIOVI), Fernando Arteche (ITA), and Diego Real (IFIC); next-generation timing systems; integrating front-end and back-end electronics.

WG 7 Mechanics & Integration: Cristobal Padilla (IFAE) and Enrique Casarejos (UV) develop improved cooling technologies and monitoring systems.

WG 8 Applications: Carlos Guerrero (US) and Gabriela Llosá (IFIC) foster synergy for societal applications such as medical and nuclear safety.

WG 9 Scintillators and Photodetectors: Luis Mario Fraile (UCM) and David Gascon (UB) enhance timing resolution and develop photosensors for extreme environments.

WG 10 Characterization Techniques: Carmen Jiménez (CNA) and Jordi Duarte Campderrós (IFCA) develop and promote new characterization methods.

WG 11 Training: Conveners to be determined, leading the organization of the instrumentation school.

WG 12 Low-Background Experiments: Susana Cebrián (UNIZAR), Francesc Monrabal (DIPC), and Roberto Santorelli (CIEMAT) to study and reduce the background in rare event searches experiments.

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- Convener: ensure all conveners in your WG are on the same footing, share the workload as convener, comprehensive approach
- Convener: identify group members, do not hesitate spamming people at this stage, it is important to identify all possible contributors/groups?
- Convener: start meeting with your groups (online), try do identify if everybody is in, or if someone is missing (convener does not necessarily know what group members know)
- Convener: check the overleaf, try to understand each section, contact coordinators if something is unclear
- Group member: who collaborates with you? Who is in your field of expertise? Are they in? Help to complete your group!
- Group member: check the overleaf, try to understand each section, something not clear: talk to your convener

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- Next meeting (online) with WGCs: **19th January 18h, 2026**

- CNID Workshop @ CIEMAT (Ines Gil), Madrid, **2-4 February 2026** (indico available soon)

Discussion/ Questions / feedback about the document/template?

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2.3 Human Resources

- Number of FTEs (**working in CNID-related instrumentation**) as of today, in the following categories: scientists, engineers, technicians, PhD students, postdocs. Please specify staff and hired members.

- Description of institutional support: electronics, mechanics, computing, and other research support services in your center.

2.4 Infrastructure and Capability Mapping

- Catalogue of instrumentation equipment and infrastructures (e.g., probe stations, bonding tools, laser labs, computing).
- Access to or participation in open/shared facilities (test beams, irradiation facilities, laser facilities, underground labs, RIB facilities, TOF facilities).
- Capabilities and expertise in software frameworks: Europractice, TCAD, CAD, LabVIEW, ANSYS, COMSOL, MCNP, GEANT4, etc.

2.5 Current and Potential National Collaborations

- Existing collaborations among national groups. Explicitly state collaborations with technical groups (technical universities, technological centers, others).
- Existing collaborations (including KTT projects) with the industrial sector and other non-academic actors (e.g., hospitals).
- Identify synergies among groups requiring coordination.
- Identify possibilities for cross-WG or inter-WG teams addressing a specific small or blue-sky R&D project (e.g., a cross-WG team including groups from the WG on calorimetry and the WG on mechanics; an inter-WG team with groups expert in CMOS and hybrid sensors to develop a high-precision spatial and timing telescope).

2.6 Internationalization

- How do national priorities align with:
  - ECFA Detector R&D strategy (e.g., DRD3, DRD6).
  - Roadmaps of the Coordinating Panel for Advanced Detectors (CPAD) of the Division of Particles and Fields, American Physical Society.
  - ApPEC and NuPECC roadmaps.
  - Topics of Horizon Europe or other EU instruments.
- what is the participation in international European R&D projects in the last five years (e.g., AIDAInnova, EUROLABS, DRD, EUROATOM).

2.7 Funding – Instrumentation

- Projects funded by AEI, CDTI, CSN, FP EU, MRR, EURATOM, regional programs, and others in the last five years (duration, funding level, coordinator or participant; if part of a broader project, indicate the fraction dedicated to instrumentation). Provide this information in a separate spreadsheet file.

3 Recommendations (Recommended: one page maximum)

3.1 Strategic Priorities for the WG (5-Year Horizon)

- Key technologies the WG should focus on. Identify key national contributions to R&D programs and enabling technologies in global projects (e.g., FCC-ee, DUNE, NUSTAR-FAIR, n_TOF, ISOLDE, DONES).

Discussion/ Questions / feedback about the document/template?

- Activities or capabilities needing consolidation.
- Areas where resources should be directed.
- Recommendations to create cross-WG or inter-WG teams addressing a specific small or blue-sky R&D project.
- Recommendations of mission-oriented task forces to address a specific critical gap identified in the SWOT's analysis. This task force should bring together the necessary national expertise and resources to close the gap. The task force activities could be partially supported through a focused mini-workshop to define scope, milestones, and required infrastructure or training (in connection with recommendations in 3.3)

3.2 Infrastructure and Resource Optimization

- Recommendations for promoting the shared usage of infrastructures.
- Equipment investments required to boost competitiveness.

3.3 Training and Talent Development

- Areas of expertise needed (e.g., highly qualified personnel in microelectronics, cryogenics).
- Suggestions for joint training actions (schools, workshops) or to support already existing actions.
- Supporting mobility of staff, technicians, or students for training.

3.4 Strategic Risks and Mitigation Measures

- Risks to achieving the scientific and technical goals of the WG.
- Mitigation proposals.

3.5 Knowledge and Technology Transfer (KTT)

- Opportunities for knowledge or technology transfer.

3.6 Internationalization

- Actions to promote participation in international R&D projects (e.g., AIDAInnova, EURO-LABS, DRD).
- Actions to promote participation in international decision-making bodies.

3.7 Funding

- How to foster increased funding levels specifically for instrumentation.

3.8 Additional Recommendations

Use this space for any other recommendation.