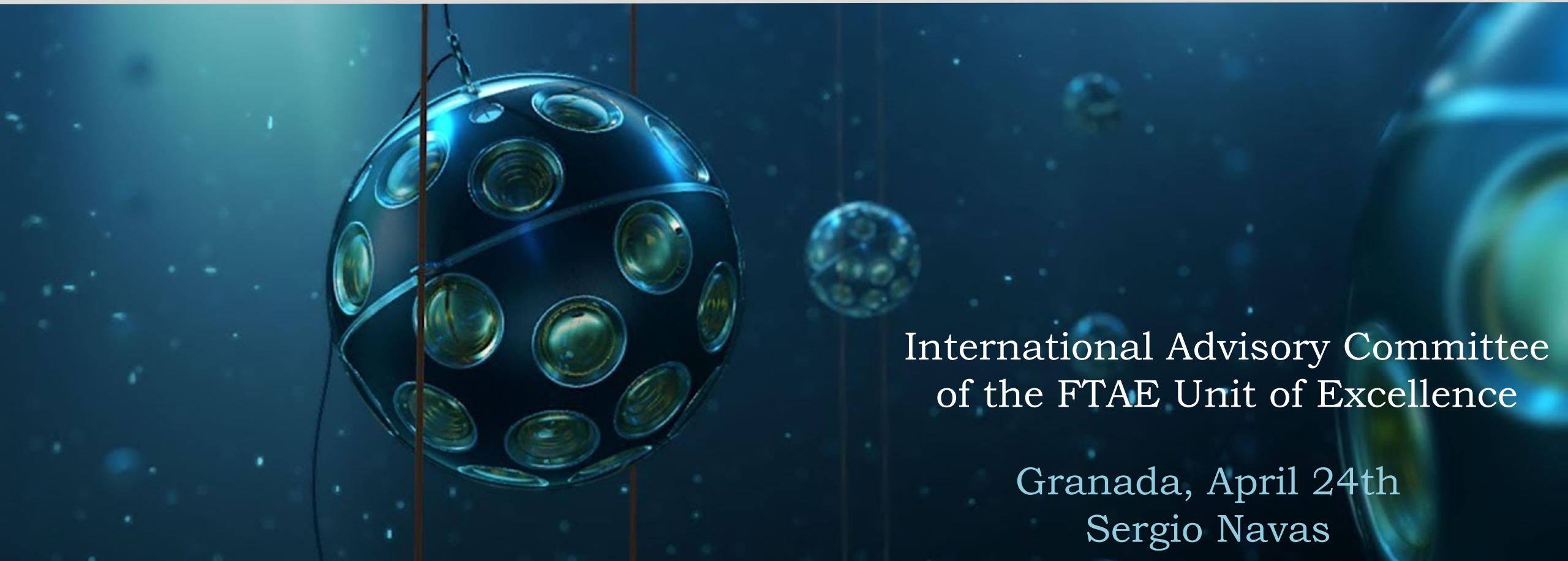
FTAE High Energy Theory

Unidad de Excelencia UGR

Neutrino Telescopes: KM3NeT & ANTARES

Particle Data Group

UNIVERSIDAD DE GRANADA



International Advisory Committee of the FTAE Unit of Excellence

Granada, April 24th

Sergio Navas

Overview of activities

Neutrino Telescopes

Full members of KM3NeT & ANTARES Collaborations

1. 

- Past: dark matter + NSI + diffuse flux of cosmic neutrinos
- Now: Committees + Legacy papers

2. 

- Analyses: multi-messenger astronomy + dark matter
- Detector construction: Granada Common Infrastructure

  Data distribution + Time synchronization + Characterization

Particle Data Group

Member of PDG since 1998

3. 

- Review of Particle Physics

Collaboration and Team

Project Coordinator

UNIVERSIDAD DE GRANADA

IFIC INSTITUT DE FÍSICA CORPUSCULAR — CSIC — VNIVERSITAT DE VALÈNCIA

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

Sergio Navas (UGR professor)
Antonio F. Díaz (UGR professor)
Carmen Guidet (Telecommunications Technology Engineer)
Mathias Walter (Industrial Electronic Engineer) 2024 – 2026
Ricardo Jaimes (predoctoral student, co-supervised with IFIC)

Cristian Díaz Martín (Industrial Electronic Engineer) 2023 – 2024

Miguel Gutiérrez (PhD Thesis in 2024 co-supervised with M. Masip)
Daniel Lopez (PhD Thesis in 2022)
N.R. Khan Chowdhury (PhD Thesis in 2021 co-supervised with IFIC)

Funding and Networking (last 5 years)

- ✓ PROYECTOS DE GENERACIÓN DE CONOCIMIENTO. Plan Estatal de Investigación ⇦ Coordinated IFIC+UPV

  PID2024-156285NB-C42 (09/2025 – 12/2028)
  PID2021-124591NB-C43 (09/2022 – 12/2025)

- ✓ Planes complementarios de I+D+I. Marco de Recuperación y Resiliencia. Junta de Andalucía 2023:
  AST22.6.2 (11/2021 – 03/2026)

  Projects in collaboration with other FTAE members:

- ✓ Proyectos Excelencia de I+D+I de la Junta de Andalucía 2018 + New 2026 call:
  P18-FR-5057 (01/2020 – 12/2022)

- ✓ Proyectos I+D+I del Programa Operativo FEDER 2018. Modalidad Frontera:
  A-FQM-053-UGR18 (01/2020 – 06/2022)

- ✓ COST Actions - European Cooperation in Science and Technology. Programme Horizon 2020:
  COST CA18108: Quantum Gravity Phenomenology in the Multi-messenger approach (03/2019 – 03/2023)

- ✓ Red Temática: MULTIDARK RED2022-134411-T (2023 – 2025)

  Red Estratégica: ERIsPAN RED2022-134204-E (2023 – 2025)

1. ANTARES

The ANTARES detector was decommissioned in 2022.
No new data since then BUT still quite some activity:

- Chair of the Publications Committee (since 2017)
- Chair of the Conferences Committee
- Institutional Board representative & Steering Committee member

- Closely involved in Legacy papers in 2025 and 2026:

1. Search for diffuse galactic neutrinos
2. Constraints on the energy spectrum of the diffuse cosmic neutrinos
3. The ANTARES detector: two decades of neutrino searches in the Mediterranean Sea
4. Search for magnetic monopoles
5. Search for cosmic neutrino sources
6. Search for dark matter from the Galactic Centre
7. Search for dark matter from the Sun
8. …

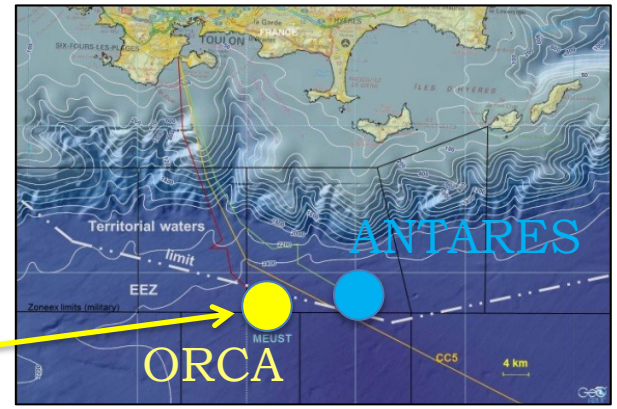
1. ANTARES

Last string recovered on May 2022

ANTARES Storey (Hall Faculty of Science)

2. The KM3NeT neutrino telescope

KM3NeT : Water Cherenkov detectors for HE neutrinos in the Mediterranean Sea, under construction
Distributed research infrastructure with 2 sites, 2 main physics topics, 1 technology



Low-energy (~GeV) studies of atmospheric neutrinos

High-energy (TeV-PeV) neutrino astrophysics

2. The KM3NeT neutrino telescope

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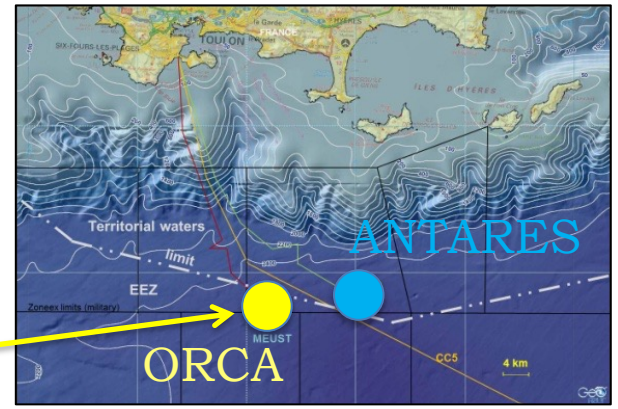

✓ **38** DUs deployed

✓ **51** DUs deployed

February 2025: Nature 638 (2025) 376

July 2025: AISBL (non-profit organization)

KM3NeT has become an Association Internationale Sans But Lucratif (AISBL).

Founding members: CNRS (France), INPP/NCSRD (Greece), University of Valencia (Spain), INFN (Italy) and NWO-I (the Netherlands).

This will help for a more efficient organization for construction, installation, maintenance, operation, scientific exploitation, and decommissioning of the infrastructure. It is a requirement to become an ESFRI landmark.

University of Granada: Observer (Council Member), first step to become Member

https://www.km3net.org/km3net-aisbl-is-born/

2.a) KM3NeT: Physics analyses

- ✓ "Search for Neutrino Non-Standard Interactions with ANTARES and KM3NeT-ORCA" (N.R. Khan Chowdhury PhD, 2021)
  - JHEP 07 (2022) 048 *(neutrino NSI with ANTARES)*
  - PoS ICRC21 1165 *(neutrino NSI with ORCA)*
- ✓ "Dark Matter and Solar Atmospheric Neutrino Searches with KM3NeT-ORCA and ANTARES" (D. López PhD, 2022)
  - JCAP06 (2022) 018
  - PoS ICRC21 1122
- ✓ "Search for Dark Matter with High-Energy Neutrinos" (M. Gutiérrez PhD, 2024)

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  - JCAP03 (2025) 058
  - PoS ICRC2023 1377 *(KM3NeT)* & PoS ICRC2023 1406 *(Sun with ORCA6)*
- ✓ "*Multi-messenger astronomy: transient neutrino sources with KM3NeT*" *(Ricardo James PhD, 2028)*
  - *TevPa (2026)*

2.b) KM3NeT: Instrumentation – "Granada Common Infrastructure"

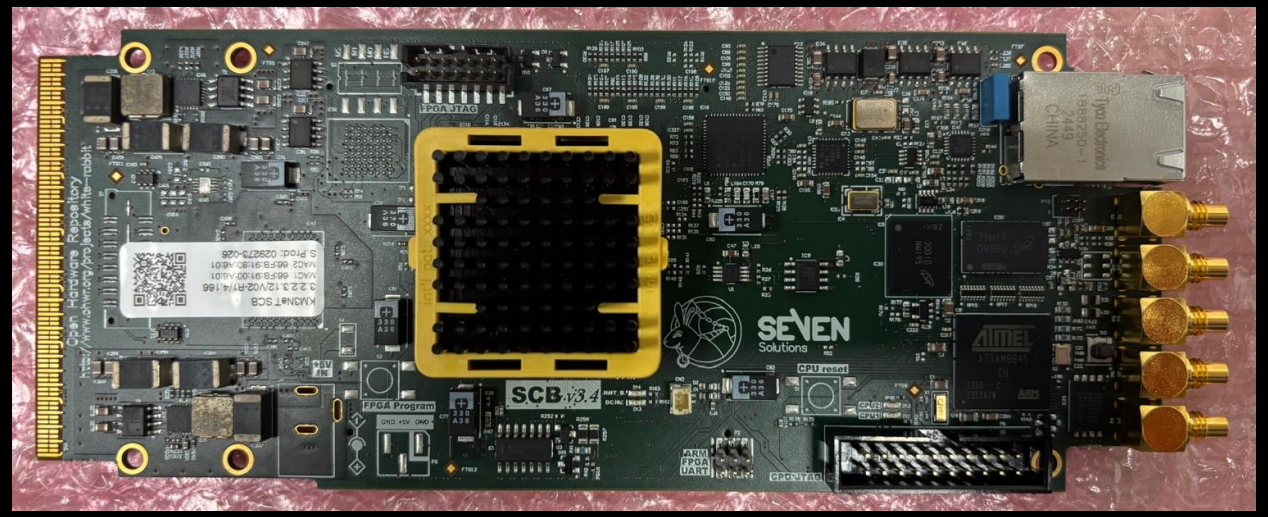
Developed a system to analyze & characterize White Rabbit–based synchronization nodes and data acquisition networks.

- Traffic generation and network performance evaluation in high-throughput data streams.
- Reliability analysis of the detector's electronic boards through monitoring of their operational stability and synchronization.
- Capability to replicate any issues identified in the DAQ of deployed DUs, enabling direct access to the acquisition electronics.
- The GCI setup includes acquisition electronics & On-shore Station replica (data processing servers, a GPS station, and the Control Unit).

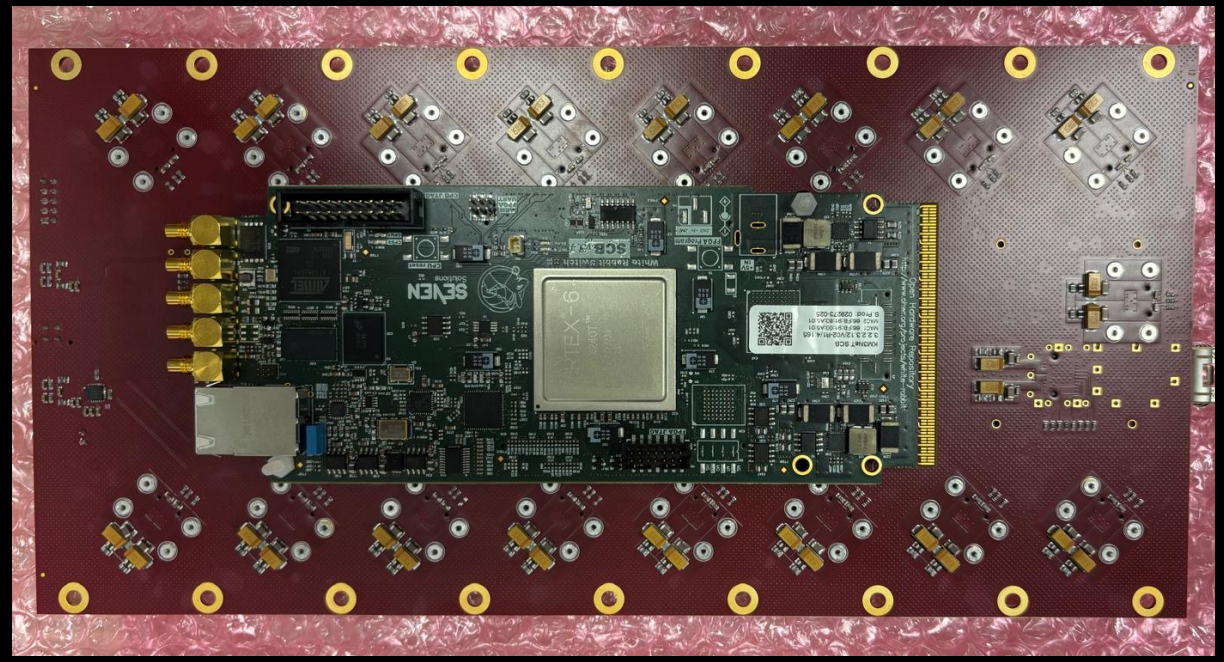
- Fully automated test suite / check of calibration
- Test setup & protocol approved by KM3NeT & Reachable remotely

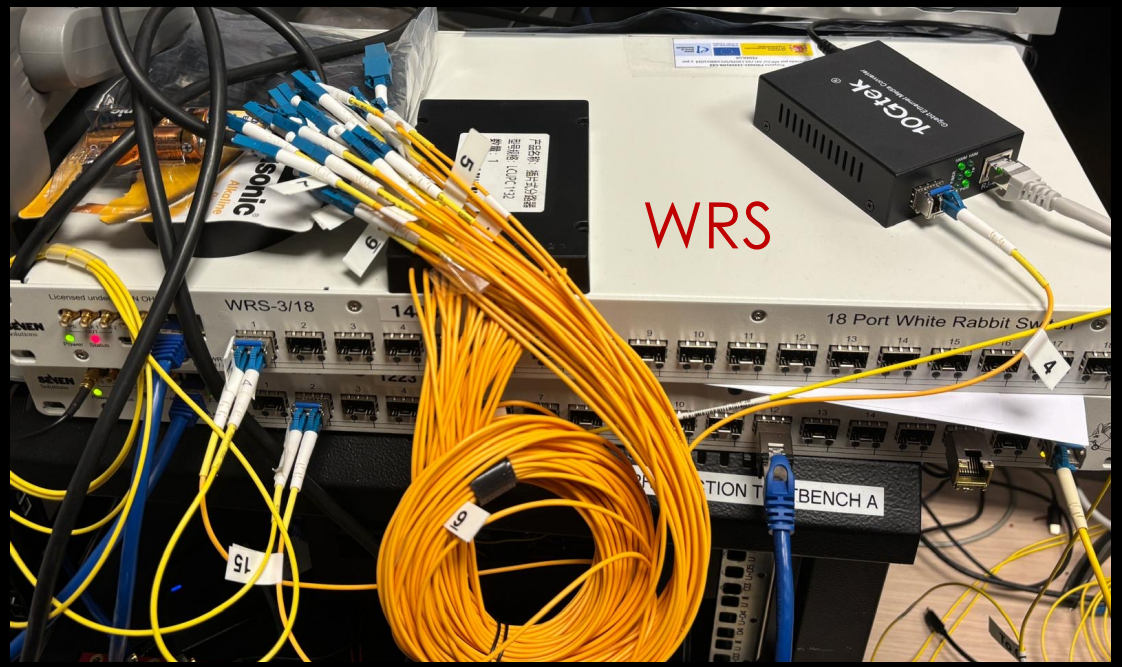
2.b) KM3NeT: Instrumentation – SCB & SBP characterization

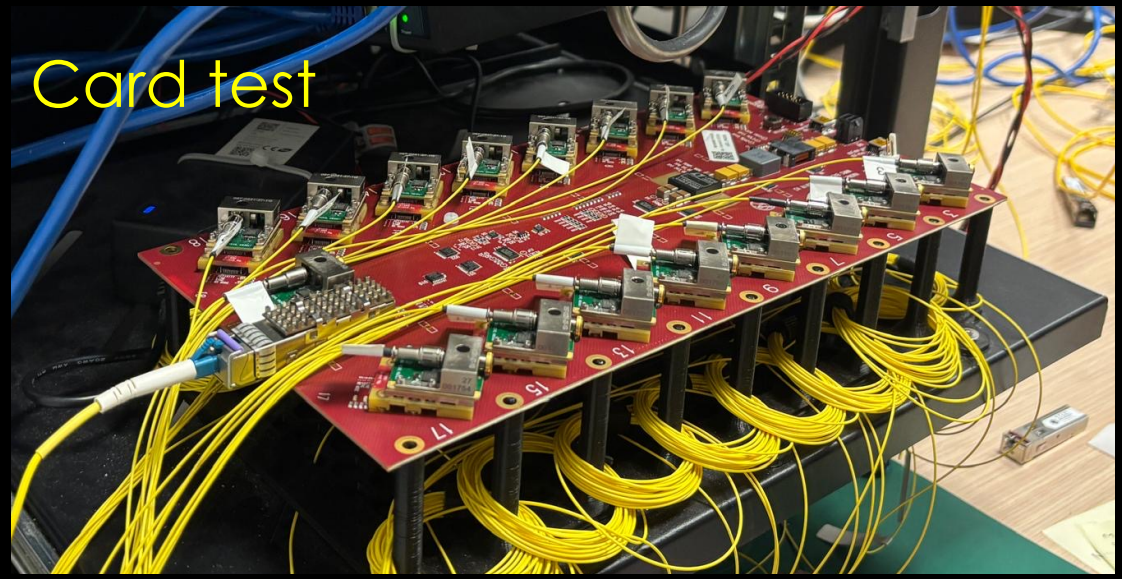
WR–SCB



WR–SBP

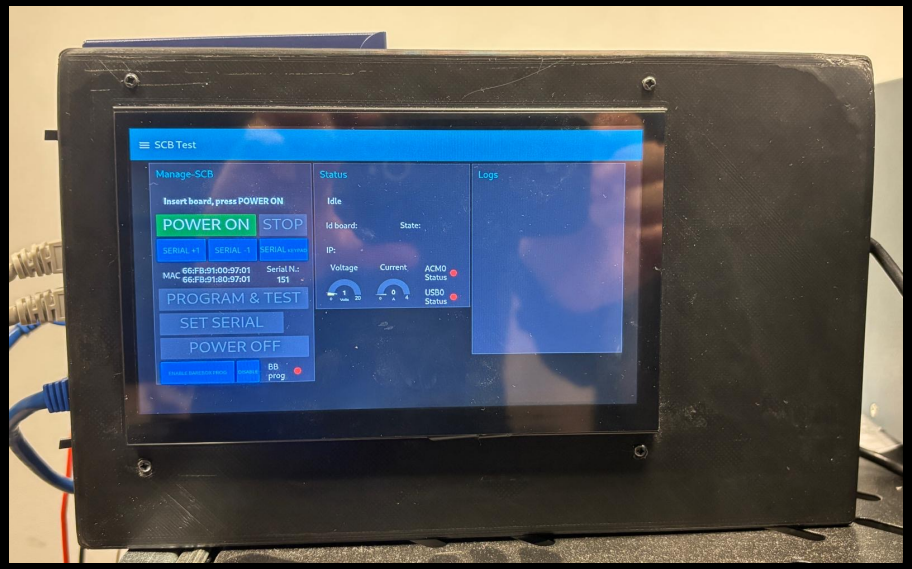




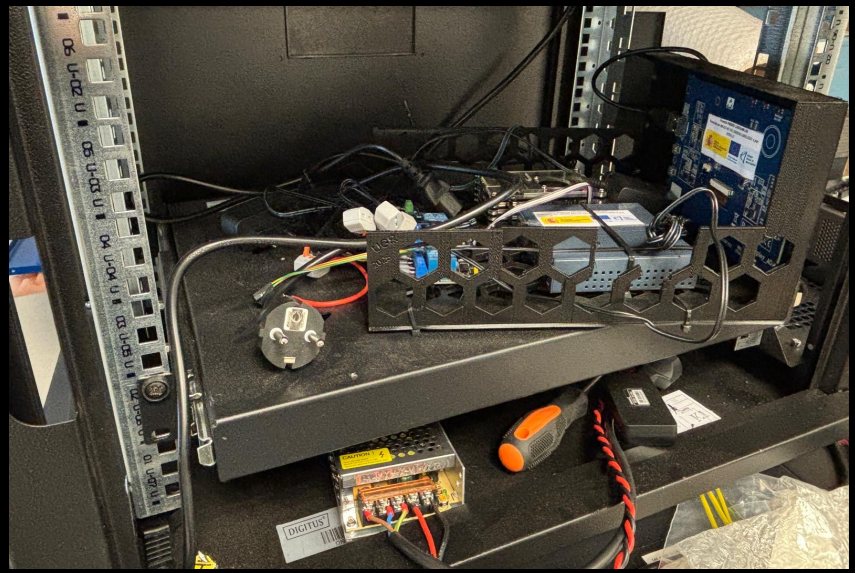


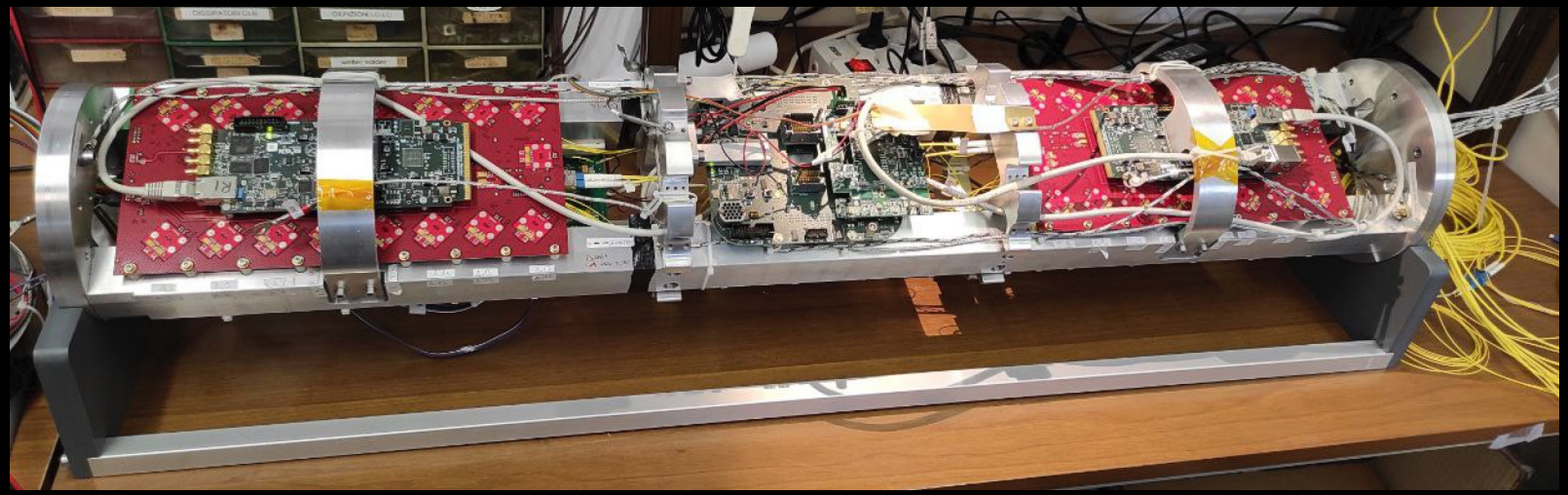
2.b) KM3NeT: Instrumentation – Monitoring interface

Fully automated test suite:



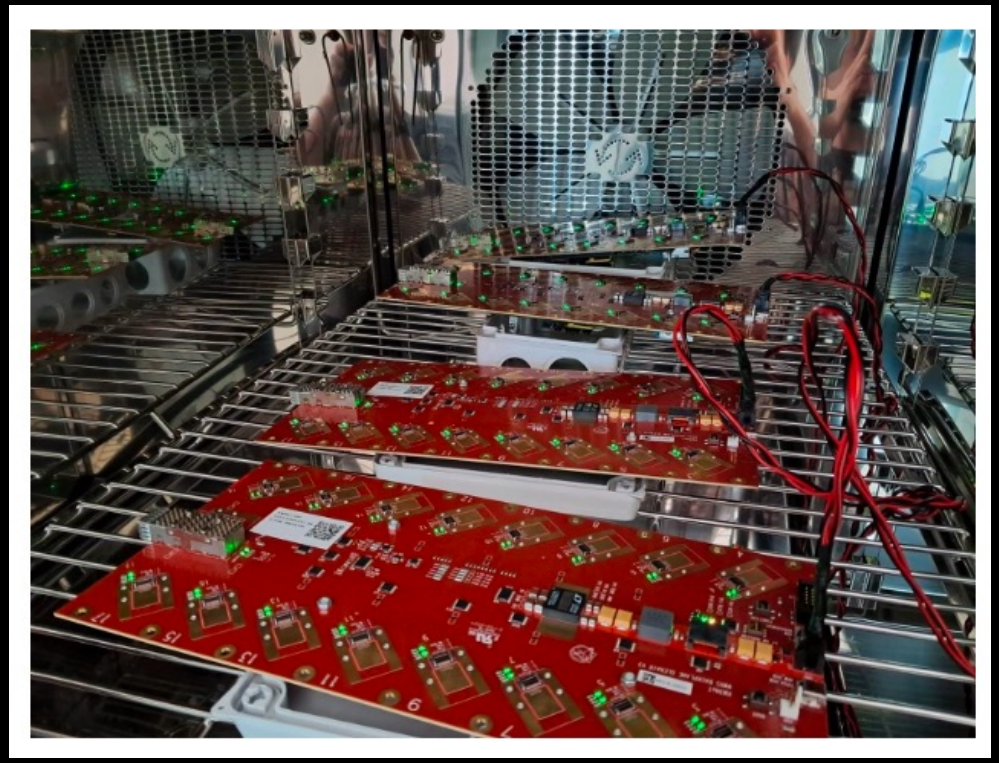
Manufactured test suite
(sent to U. Bologna & ROMPAL):





2.b) KM3NeT: Instrumentation – SCB & SBP characterization

Climatic chamber in Granada allowing for full stress Hass tests from –35° to 80°



3. PDG Contribution

Member of the PDG since 1998

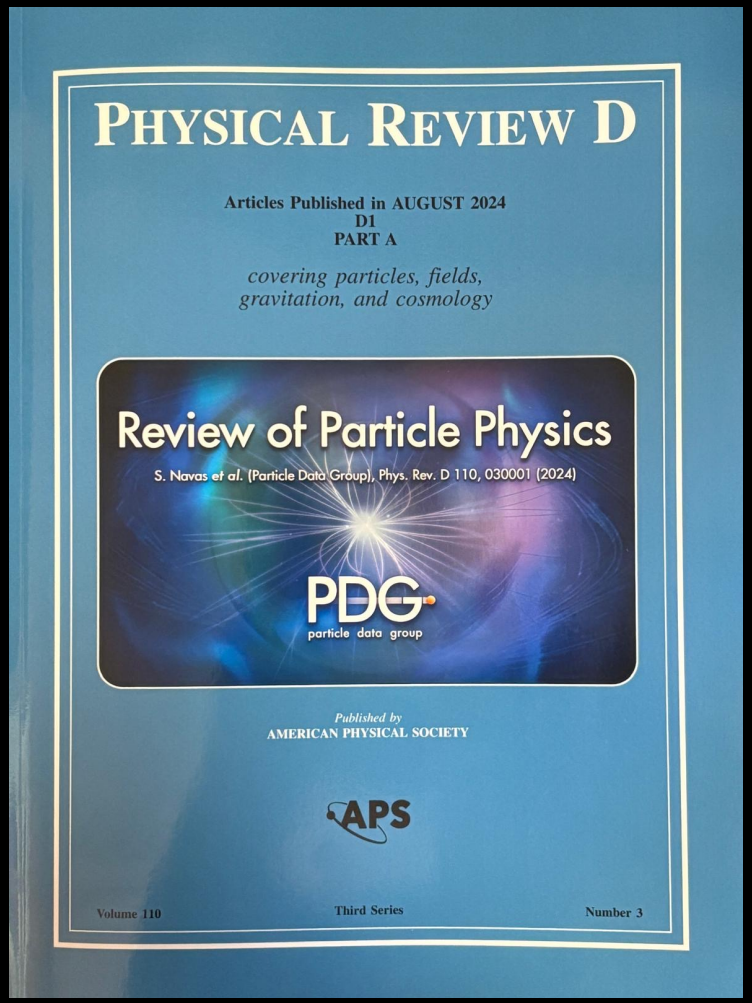
Last publication: S. Navas et al. Phys. Rev. D 110, 030001 (2024)

Main activities in the "Meson Team"

- Literature scan
- Published measurements: compilation & evaluation
- Mass, Width, Decay Branching Ratios
- Cross-particle fitting program
- Data Encoding

Reviews:

- Branching Ratios of $\psi(2S)$, $\chi_{c0,1,2}$ and η_c
- Spectroscopy of Mesons Containing Two Heavy Quarks
- Monte Carlo Particle Numbering Scheme
- Charmonium system
- Bottomonium system



3. PDG Contribution

A) pdglive.lbl.gov

PDG Live — particle data group

PDG HOME | SHORTCUTS | CITATION | CONTACT | ABOUT

The Review of Particle Physics (2025)

S. Navas *et al.* (Particle Data Group), Phys. Rev. D **110**, 030001 (2024) and 2025 update

Gauge & Higgs Bosons reviews
- γ
- gluon
- graviton
- W
- Z
- H
- Neutral Higgs Bosons, Searches for
- Charged Higgs Bosons ($H^{\pm}$, $H^{\pm\pm}$)
- Heavy Bosons
- Axions

Leptons reviews
- e
- μ
- τ
- Heavy Charged Lepton
- Neutrino Properties
- Number of Neutrino Types
- Double β-Decay
- Neutrino Mixing
- Heavy Neutral Leptons

Quarks reviews
- Light quarks (u, d, s)
- c
- b
- t
- b'
- t'
- Free quark

Mesons reviews
- Light Unflavored
- Strange
- Charmed
- Charmed, Strange (incl. possibly non-$q\bar{q}$ states)
- Bottom
- Bottom, Strange
- Bottom, Charmed
- $c\bar{c}$ (incl. possibly non-$q\bar{q}$ states)
- $b\bar{b}$ (incl. possibly non-$q\bar{q}$ states)
- Other Mesons

Baryons reviews
- N Baryons
- Δ Baryons
- Λ Baryons
- Σ Baryons
- Ξ Baryons
- Ω Baryons
- Charmed Baryons
- Doubly-Charmed
- Bottom Baryons
- Exotic Baryons

Other Searches reviews
- Magnetic Monopole
- Supersymmetric Particles
- Technicolor
- Quark and Lepton Compositeness
- Extra Dimensions
- WIMPs and Dark Matter Searches
- Other Particle Searches

Conservation Laws reviews
- Discrete Space-Time Symm.
- Number Conservation Laws

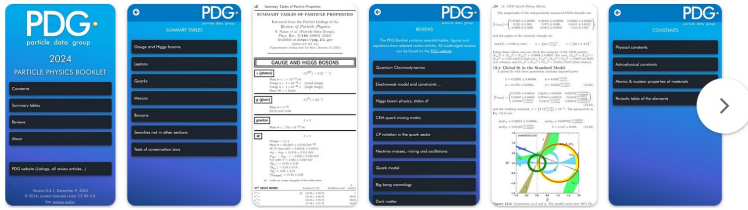
B) Google Play

PDG Particle Physics Booklet

Berkeley Lab

10 mil+
Descargas

Descargar



Información de la aplicación →

Esta aplicación hace que el Folleto de Física de Partículas de PDG esté disponible en su teléfono, incluso cuando no tiene acceso a Internet.

El Folleto de Física de Partículas es la versión abreviada de la Revisión de Física de Partículas publicada por Particle Data Group (PDG). Proporciona promedios de PDG y valores de ajuste para masas, anchos o tiempos de vida de partículas, fracciones de ramificación y otras cantidades importantes, así como tablas, figuras y...

Última actualización
11 dic 2024

PEGI 3
Más información

Asistencia de la aplicación

Sitio web

Correo electrónico de asistencia
support@pdg.lbl.gov

Política de Privacidad

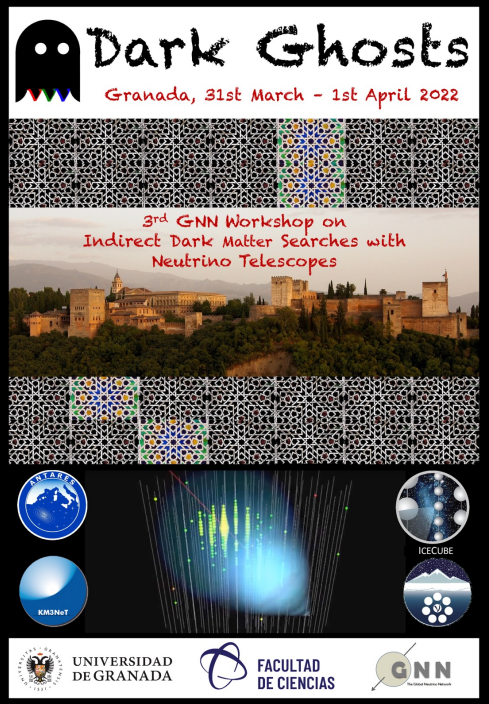
Información del desarrollador
UNIVERSITY OF CALIFORNIA, BERKELEY
it-google-play@lbl.gov
1 Cyclotron Rd
Berkeley, CA 94720
United States
+1 646-833-8131

Organization of Meetings & Workshops

KM3NeT – ANTARES Collaboration meeting 2018

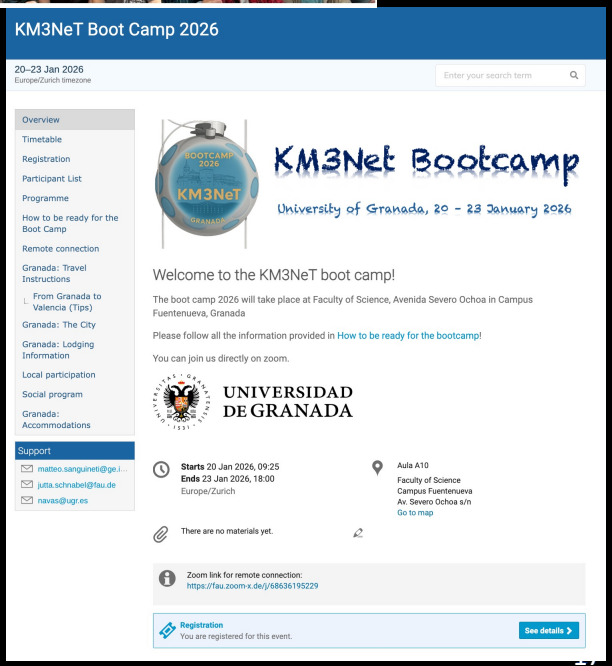
COST action general meeting 2020

FTAE
High Energy Theory



Dark Ghosts 2022

KM3NeT Astro WG F2F 2024



KM3NeT Bootcamp 2026

Outreach Activities (last 5 years)

- ✓ Ayudas FECYT para el Fomento de la Cultura Científica:
  FCT-18-13754: "Granada, ciudad para la ciencia, ciencia para la ciudad"
  FCT-18-13747: "Maratón de Astropartículas"

  Proyecto Comisión Europea para el Fomento de la Cultura Científica e Innovación:
- ✓ H2020-MSCA-NIGHT : "European Researchers' Night"
- ✓ Faculty of Science: Semana de la Ciencia, Aula Científica Permanente …
- ✓ Faculty of Science: permanent exhibition of ANTARES module
- ✓ Cátedra Hemilio Linares de Ciencia y Tecnología – La Madraza
- ✓ El Parque de las Ciencias – "inVISIBLE Exhibition" (2024 – 2025)
- ✓ TV Canal Sur Andalucía – "ConCiencia Neutrinos" (2025)