

INTENSE

Particle physics experiments at the high intensity frontier, from new physics to spin-offs. A cooperative Europe-US-Japan effort



Transfer of Knowledge

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Annual General Meeting, 6-7 Nov. 2019



European Commission



RISE - specific objectives Knowledge Transfer (ToK)

- “The RISE scheme will promote international and inter-sector collaboration through research and innovation staff exchanges, and sharing of knowledge and ideas from research to market (and vice-versa) for the advancement of science and development of innovation.”
- “The scheme fosters a shared culture of research and innovation that welcomes and rewards creativity and entrepreneurship and helps to turn creative ideas into innovative products, services or processes.”

[The European Commission: 2014-2015 Work Programme]



WP7 - Main Objectives

- O6.1: Coordinate all the activities dedicated to the training of personnel
 - ➔ maximize transfer of knowledge among INTENSE participants
 - ➔ increase the quality of the research and the competitiveness of participant institutions.
- O6.2: Provide trained personnel with sufficient resources
 - ➔ independence in the acquired skills.



T7.1. Research-Industry ToK



ALL participants are concerned

- Direct involvement of non-Academic personnel in the research activities of the Academic partners.
- Training of non-Academic personnel during their secondments at research institutions on the technologies employed in particle physics research and muography.
- Coordination of the activities connected to other WPs.
- Reporting of the ongoing activities during the periodic SB Meetings.

T7.2 - Training on the use of FNAL/CERN infrastructures, detectors commissioning and operation



Researchers seconded at FNAL/CERN to be trained by FNAL/CERN personnel on:

- the use of local infrastructures, laboratories, mechanics and electronics shops and computing resources,
- undergo the relevant job hazard, electrical and radiation safety training.
- detectors commissioning and operation.



UNIVERSITÀ DI PISA



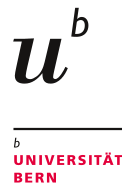
The University of Manchester



T7.3 - Training on muography

UCL, UNIBE, INGV, UGHENT, UTOKYO, UNAGOYA:

- 1-day training on detector techniques and data analysis techniques applied to muography in coincidence with the INTENSE annual General Meetings.



T7.4 Training on project management



B12, CAEN, CLEVER, SEEMS, TECNOIN:

Private companies to organize specific trainings for academic researchers on project management of personnel and finances and on business strategy, recruitment and careers.





T7.5 - Training courses

- ALL participants are concerned
- Organize special training courses on the side of the General Meetings on:
 - Research development in fundamental physics (specific advanced topics from) or
 - Technological developments from companies.

This activity is being planned

**Clever Secondments at CERN:
An Experienced Researcher from CLEVER OPERATION,
Dr. Radia SIA, stated in Feb. 2019 about 5 months FTE
secondments, devoted to WP7 (Knowledge Transfer).**



Transferring Knowledge from Clever: EU Open Science to Open Innovation



- I provided strategic support and expert insights to the CERN's Open Science to Open Innovation initiatives in particle physics, mainly in designing a "sustainable" eco-system based on the Maxi-ATTRACT initiative (a series of Phase 1 and Phase 2 calls for proposals - the European Commission).
- My input was mainly regarding the determination of:
 - present and future Open Science and Open Innovation challenges, needs and policies;
 - mechanisms, tools and services that can address those needs and challenges;
 - Appropriate operation model and mechanism, framework, infrastructure, governance and sustainability; candidates selection criteria, programme's and projects' execution and management, impact maximization and funding...





T7.4

Clever's Training on project management

With more than 30 years of cumulative experience in sensor technologies, management, innovation and funding, Clever Operation is available to transfer its knowledge by providing to the personnel from partner institutions the following training sessions and webinars:



- Project management practices and tools: strategic, financial, technical, reporting, HR and career development...
- Open Science - Open Innovation ;
- Applications of particle physics detector technologies in other fields: nuclear industry, medical, security, space missions, education ;
- From Ideas to Business Plan elaboration ;
- From R&D, Technology Road-Mapping to Product Development ;
- Business strategies and processes.

Transferring Knowledge from Clever: Planning and Management of CERN Open Days - Neutrino Platform (NP) Outreach Activities



- Taking advantage of the “long shutdown”, CERN opened its doors on 14 and 15 September 2019 to the **75 000 visitors** from the public.
- Activities included visit points all over the site’s facilities, both underground and on the surface, experimental workshops, performances...
- CERN open days → NP open days → NP outreach activities: Clever contributed to this significant event by sharing its knowledge in project planning and management and provided support to the preparation of the event related to the visits to the EHN1 Hall.





T7.1 as related to WP1 - Neutrino detectors

- Introduction by Prof. Nessi to the EHN1 Neutrino Platform (NP), premises and projects ;
- Meetings and discussions with researchers/scientists, engineers, students and managers ;
- Familiarization with DUNE (Deep Underground Neutrino Experiment) and ICARUS (Imaging Cosmic And Rare Underground Signals) experiment) at FermiLab:
 - Physics objectives and operational requirements,
 - Detectors and technologies,
 - Standing point in terms of R&D an Innovation.
- Planning the execution of the INTENSE WP1 research tasks involving Clever Operation, mainly Task 1.4 at CERN.

The DUNE Experiment



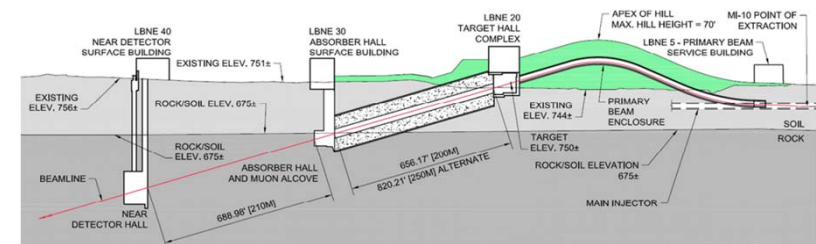
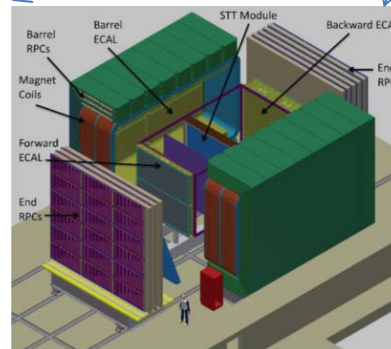
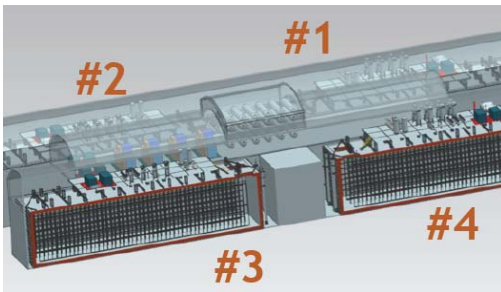
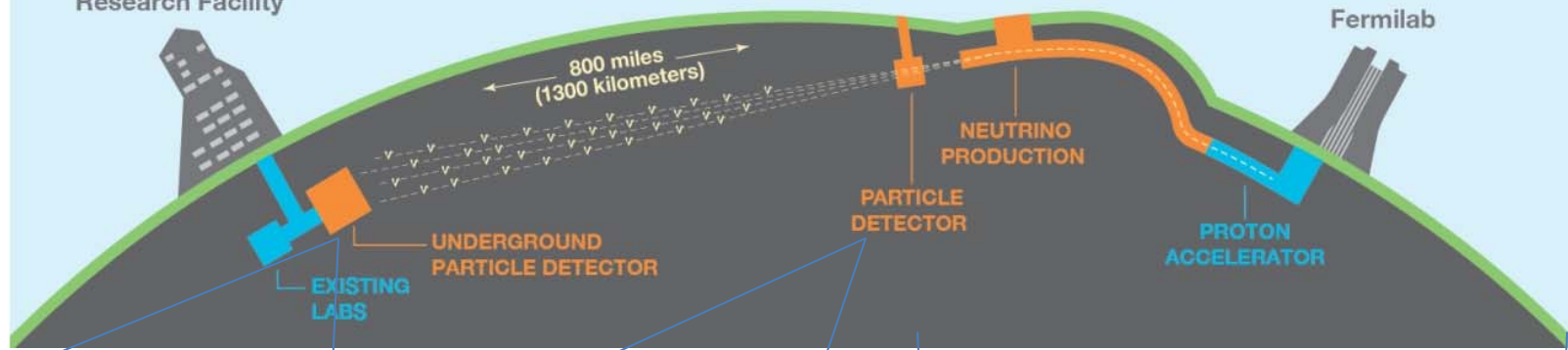
Observe ν_e appearance and ν_μ disappearance at long baseline using a wideband beam to measure MH, CPV, and neutrino mixing parameters in a single experiment.



Sanford Underground Research Facility

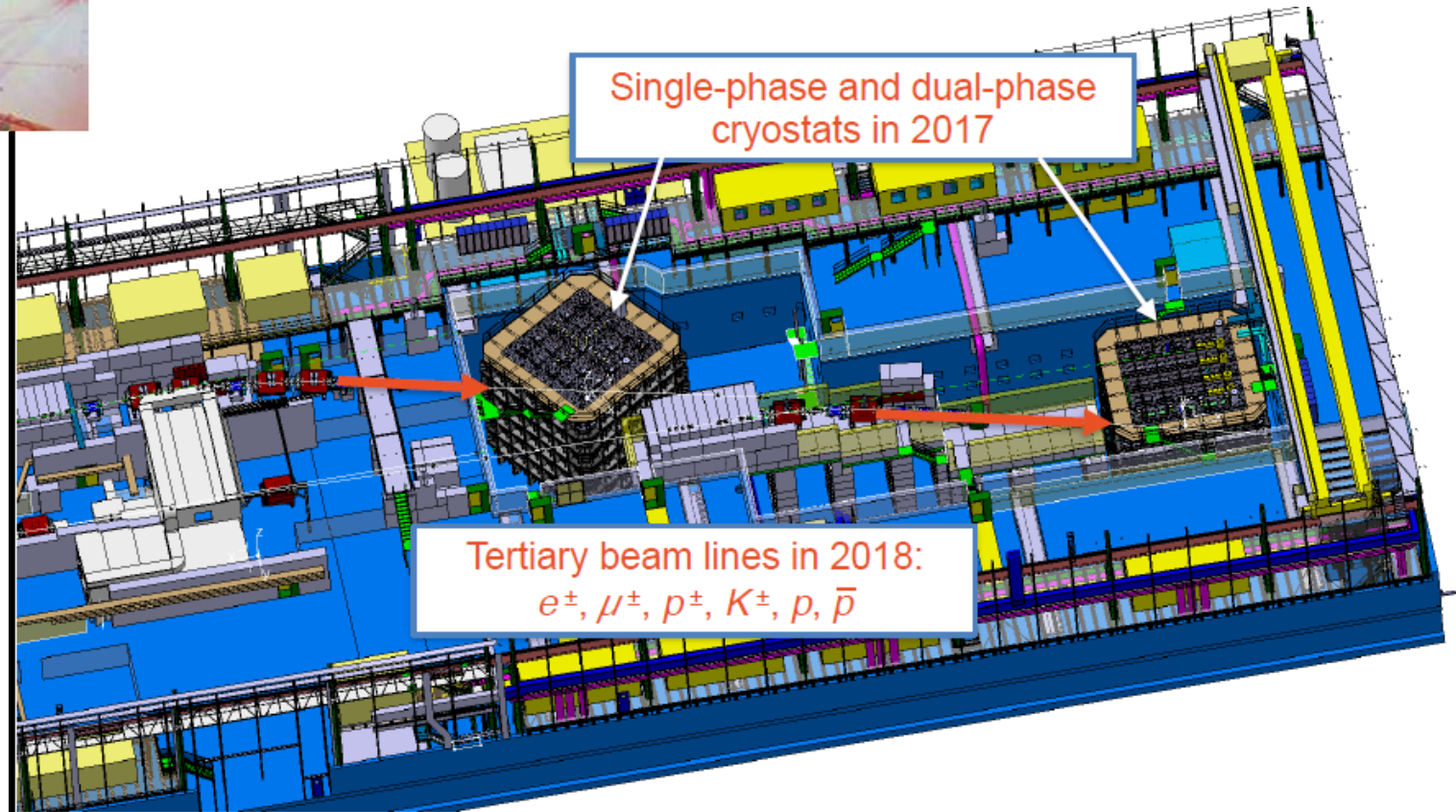


Fermilab

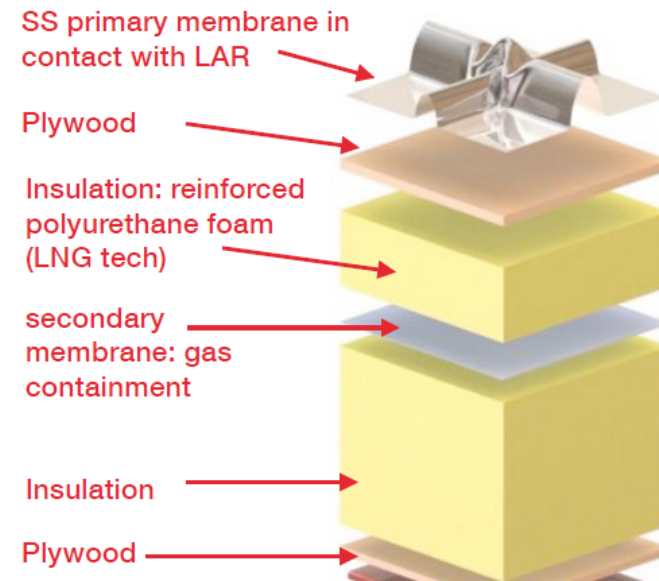
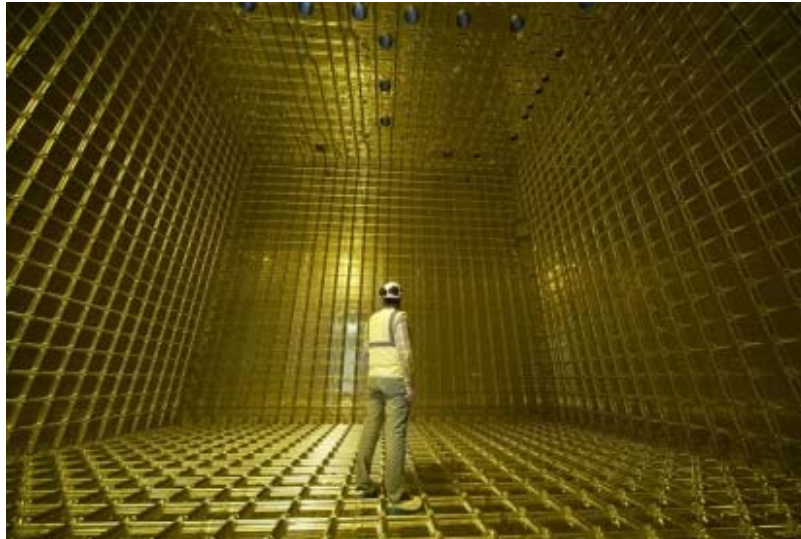




Neutrino Platform @ CERN (EHN1 hall)

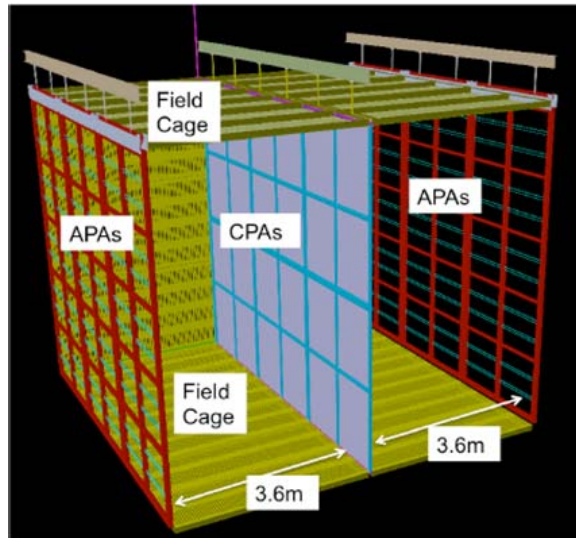


T7.1 as related to WP1 - Neutrino detectors



- Liquid Argon Time Projection Chambers (LAr-TPC),
- Neutrino interaction in LAr → particle tracks → 3D image created through a series of parallel wire planes.
- New concept of cryostats for Argon purge: significant dimensions + membrane technology developed for LNG transport ships (GTT) and adapted for LAr-TPC.

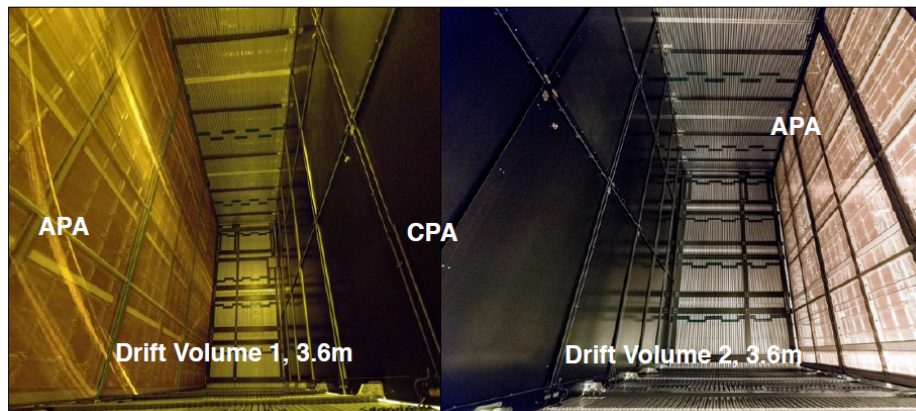
Dune Single Phase (SP)



6 x Anode Plane Assembly

Cathode Plane Assembly

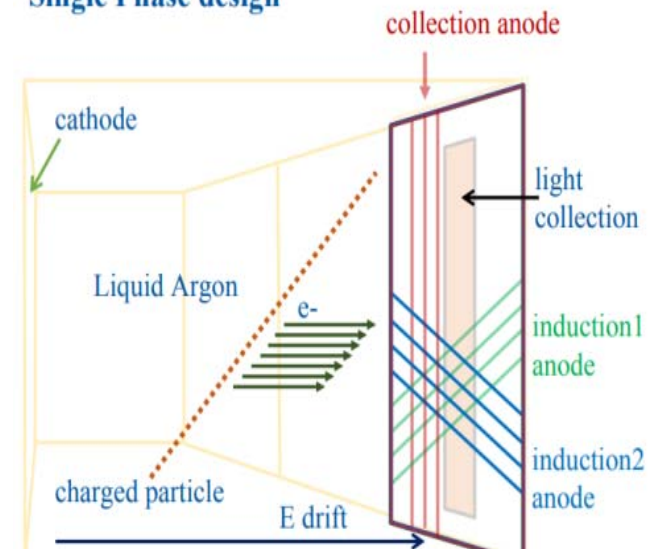
Photon Detection



LAr TPC:

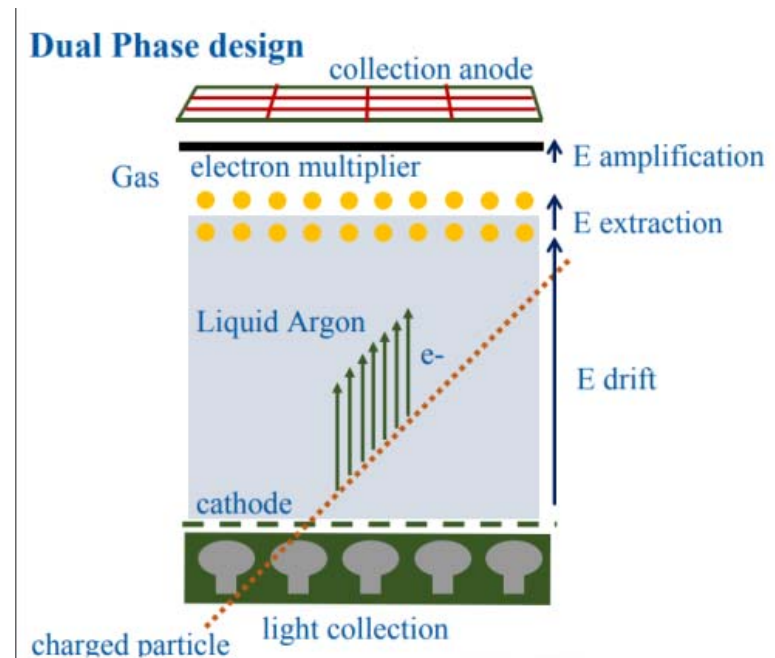
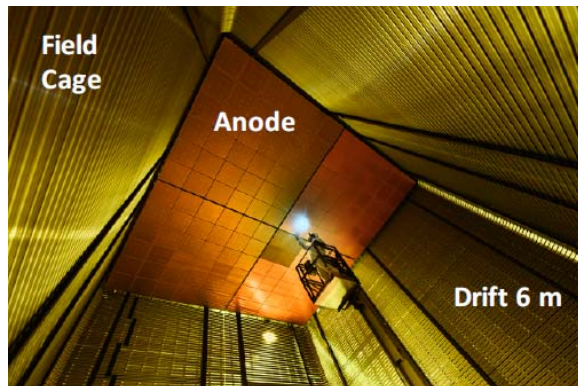
- Cathode in the middle
- Electrons drift horizontally.

Single Phase design





Dune Double Phase (DP)



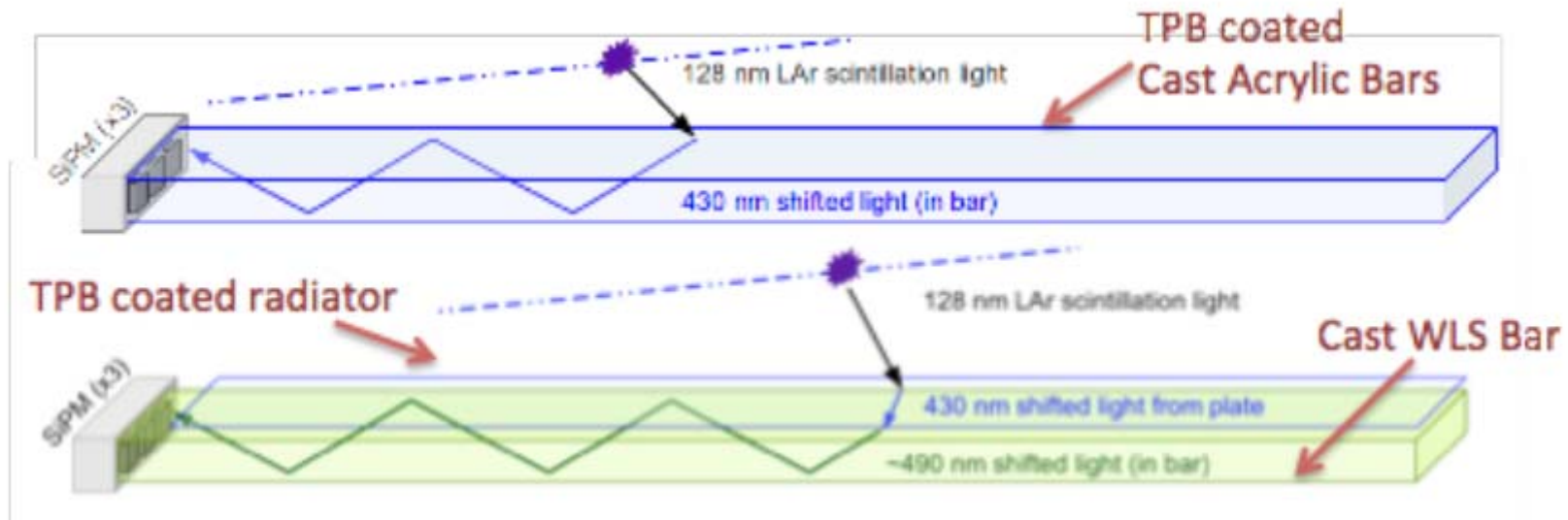
LAr LEM TPC:

- Electrons drift upward to deposit charge on charge readout planes (CRPs);
- signal amplification in gaseous argon above the volume of LAr.

Wrt SP, expect a 20-fold increase in signal amplification



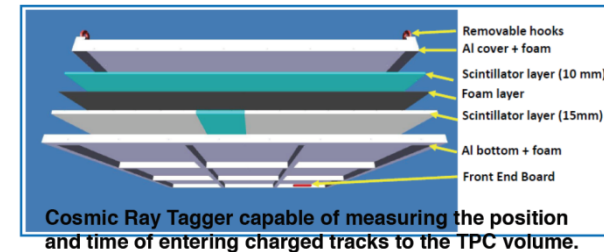
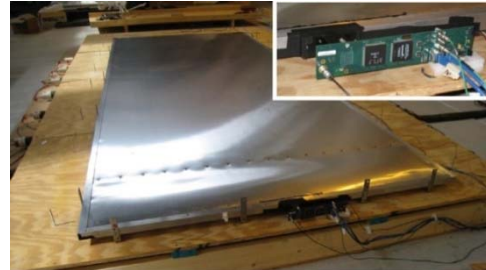
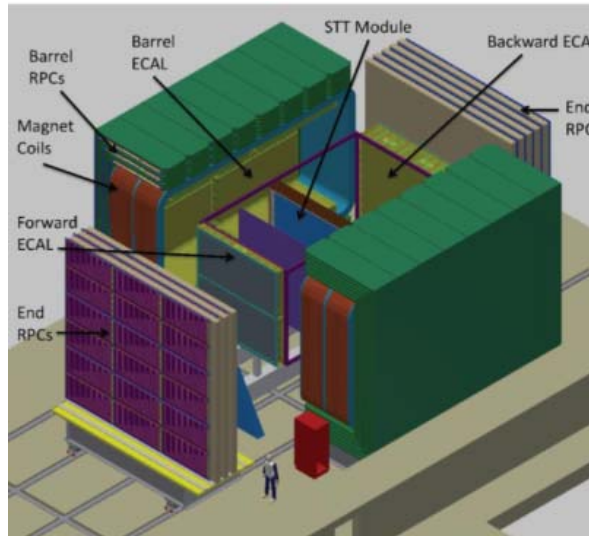
DUNE SP - Photon Detection



- Scintillation light detected → determine event's time and position
- LAr - 24 K photons/MeV @ 128 nm → wavelength shifting + SiPM in the APAs



T7.1 as related to WP1 -T1.4. ICARUS



- CERN: Top CRT with INFN
- Task 1.4: Complete the installation and commissioning of the ICARUS CRT and its signal exploitation for trigger purposes (INFN, CERN, CAEN, CLEVER, FNAL)
 - CRT scintillation system to identify charged particles entering the cryostats.
 - Data from CRT to be combined with that from inner PMTs to determine the direction of cosmic rays.
 - The CRT front-end electronic system based on the DT5702 module (CAEN and UniBe) to be tested and commissioned.

Clever is available during the ongoing secondments to share its expertise in radiation detection using scintillation and SiPM readout...

Acknowledgement



- Thanks to the European Commission
- Special thanks to:
 - The Programme Coordinator Simone Donati,
 - Professor Marzio Nessi





References

- To be added here