May 3rd, 2024
15:00

Prof. Anatael Cabrera
CNRS / Université Paris-Saclay — IJCLab (Orsay, France)

BACKGROUND
- Particle Physicist — neutrino science since 2001
- **DPhil** at the University of Oxford (2001-2005)
- PostDoc at College de France (2005-2006)
- Marie Curie Fellow at APC Laboratory (2006-2007)
- **CNRS scientist** (staff) since 2007
  - -APC Laboratory (Paris): 2007-2018
  - -LAL Laboratory (Orsay): 2018-2020
  - -IJCLab Laboratory (Orsay): since 2020

PROJECTS
- **SuperChooz (2018)**
  - -responsible scientific (since 2022)
- **CLOUD / AntiMatter OTech (2020)**
  - -co-spokesperson & EIC coordinator
- **LiquidO (2012)**
  - -co-spokesperson (since 2016)
- **JUNO (2015)**
  - -double-calorimetry (since 2015)
  - -SPMT system coordinator (2015-2020)
- **Double Chooz (2005-2023)**
  - -spokesperson (since 2017)

LiquidO: Fundamental Particle Detection & Imaging in Opaque Media

Abstract

The *neutrino* (ν) discovery in the 50s paved the technical ground behind the establishment of much of today's neutrino detection, which may be considered the ultimate achievement in fundamental particle detection. Large instrumented volumes have been achieved via a fundamental implicit principle: the impeccable transparency of the detector. This remains true almost regardless of the detection technique. Much of that technology has yielded historical success, including several discoveries, leading to an essential modification of the Standard Model of Particle Physics. Even after about 70 years of maturity towards perfection, much of that technology is also known to suffer from some key limitations. The pending challenge is to endow these detectors with a powerful active background rejection up to low MeV energies (i.e. regime typical for natural radioactivity) while keeping their large-volume articulation. Indeed, particle identification is improvable, forcing experiments to rely on cumbersome and expensive external shield (active or passive) setups. Currently, passive shielding strategies, such as the overburden in underground laboratories, remain fundamental tools to mitigate the otherwise overwhelming cosmogenic backgrounds.

I shall introduce the novel **LiquidO** technology, relying heavily, for the first time, on light detection in "opaque" media. In this way, LiquidO enables sub-atomic particle event-wise imaging, so event topology, which, once combined with fast timing, the combined system allows powerful particle-ID even at MeV energies. The development is led by the homonymous international academic consortium, with institutions from over 11 countries. LiquidO appears capable of offering several detection features that might lead to a breakthrough potential in neutrino, rare decay physics and generally high-energy physics. The performance of LiquidO is better with higher energies, starting from a fraction of MeV, if scintillation is used. Its preliminary physics potential will also be highlighted. LiquidO opens a test-bed context for further detection R&D, where further innovation is ongoing, including pioneering new technology elements such as opaque scintillators.

Academia C²TN
SEMINÁRIOS · Workshops · Ações de formação · Mesas redondas

C²TN | TÉCNICO LISBOA