



Istituto Nazionale di Fisica Nucleare  
SEZIONE DI PADOVA



Dipartimento  
di Fisica  
e Astronomia  
Galileo Galilei

# Seminar

## Monday, October 30th – 11:00

**Room VOCl**  
(Dpt. of Physics and Astronomy)

*Zoom Link:*

<https://unipd.zoom.us/j/87653466887>

<https://agenda.infn.it/event/38031/>

# The SuperChooz Experiment Exploration

***Dr. Anatael Cabrera***

*IJCLab / LNCA (Chooz) - CNRS / Université Paris-Saclay*

## Abstract

A new Europe-based flagship neutrino experiment potential opens by exploiting a unique opportunity in the Chooz nuclear reactor site (France) — Europe's most renowned site for reactor neutrino research. The overall experimental physics programme will be described in this seminar.

The SuperChooz project is tied to the dismantling of the EDF's Chooz-A nuclear reactor complex. Built around the '60s and unknown to most scientists, the Chooz-A site offers an underground volume of up to 50,000 meter-cube available for fundamental neutrino science using the EDF Chooz-B reactors (two powerful N4) as the source, located about 1km away. The combination embodies the most ambitious generation of possible fundamental science at Chooz so that the primary detector may reach a scale comparable to the world's largest neutrino detector. The main experimental challenge is the site's shallow overburden demanding the use of the novel LiquidO technology (web: <https://liquido.ijclab.in2p3.fr>), originally pioneered around 2012 by the CNRS (France) and now led by the homonymous international consortium (~90 scientists from 24 institutions in 11 countries). This new detection methodology heralds the unprecedented active background rejection needed, including detection capabilities beyond reactor neutrinos only. Indeed, SuperChooz's physics programme is designed to yield some of the world's most precise measurements in the field and probe a few of the most insightful building-block symmetries of the Standard Model, thus enabling unique discovery potential. SuperChooz programme also offers synergy potential, allowing to boost the sensitivities of today's generation of neutrinos flagship experiments, such as DUNE (US), JUNO (China) and HyperKamiokande (Japan).

The SuperChooz project was first presented at CERN EP-colloquium (Nov. 2022) upon the CNRS and EDF signature of a dedicated cooperation agreement (Sept. 2022), officially starting the "SuperChooz Pathfinder" era to address the project technical feasibility assessment by 2028. Today's physics potential studies benefit from much data-driven information obtained from the Double Chooz experiment, enabling much of the knowledge for the accurate design of SuperChooz. The missing knowledge regarding the new LiquidO performance is expected to be demonstrated by the CLOUD experiment (first release in Venice in Oct. 2023), thus addressing the SuperChooz technical feasibility via a dedicated programme on fundamental physics. CLOUD is the other facet of the approved Europe-based "AntiMatter-O'Tech" project, funded by the EU-EIC (France, Germany, Spain) and UKRI (UK), focusing on industrial reactor monitoring.