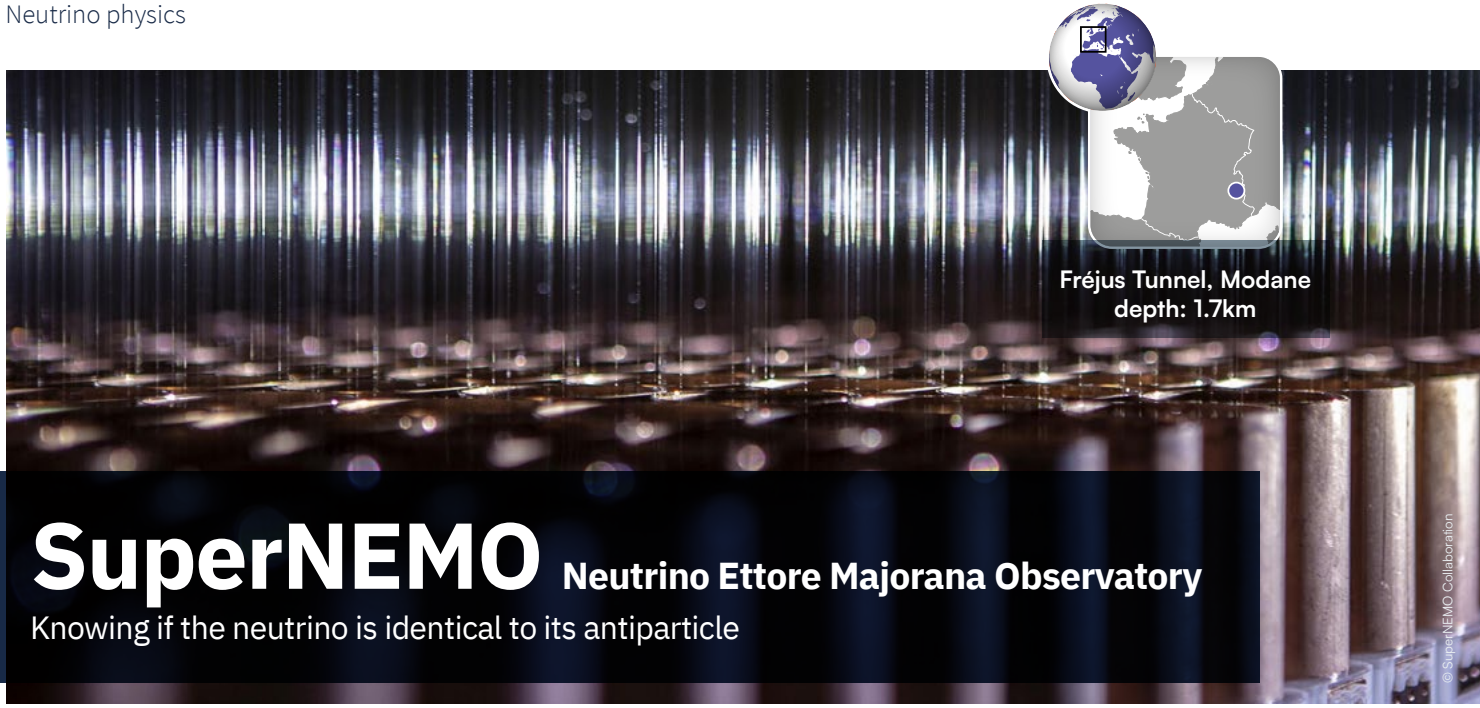

SuperNEMO Neutrino Ettore Majorana Observatory

Knowing if the neutrino is identical to its antiparticle

Scientific leader: Laurent Simard (IJCLab) *

Laboratories involved: CPPM (Marseille), IJCLab (Orsay), LAPP (Annecy), LP2I (Bordeaux), LPCC (Caen).

Nature: research infrastructure

Status: International project at the end of its installation at the LSM, involving 21 institutions from 9 countries (United States, Finland, France, Great Britain, Japan, Czech Republic, Russia, Slovakia, Ukraine)

Website: https://supernemo.org

Scientific objectives

The SuperNEMO demonstrator is to validate a new method to search for double beta decay without neutrino emission. The observation of this process would prove that the neutrino is a Majorana particle, identical to its antiparticle. This would constitute an important avenue of research beyond the Standard Model. The detector permits a complete reconstruction of the emitted particles, which allows a very efficient rejection of the background noise and a precise characterisation of the decays.

Resources deployed

At its centre the detector contains a thin panel of very pure Selenium enriched in 82Se, 12 m^2 in area and less than half a millimetre thick. This serves as a double beta radioactive source. On either side of this source, detectors (a wire chamber operating in the Geiger regime and a calorimeter composed of scintillating plastic blocks coupled to low-radioactivity photomultipliers) capture all the particles emanating from the Selenium. The selection of very low radioactivity materials for the detector and effective shielding ensures a very low background level.

$48m^3$
volume of the detector

21
research institutions

The detector is **1 000** times less radioactive than the human body (for the same mass)

9
participating countries

$4x10^{24}$
years: expected limit after 2.5 years in the absence of a signal on the half-life of the phenomenon

IN2P3 CONTRIBUTIONS

- Responsible for the mechanical construction of the calorimeter and the design, manufacture and testing of the associated electronics.
- Responsible for the installation of the demonstrator at the LSM.
- Responsible for the manufacture of the sources.
- Measurement of the radioactivity of the components.
- Technical responsibility for SuperNEMO.
- Analysis of data from the predecessor detector, NEMO-3.

2011 End of NEMO-3 data collection

2015 Start of installation at the LSM

2018 Closure of the SuperNEMO demonstrator

2019 Start-up of the calorimeter

2021 Sealed detector, first trace detector data

2023-2024 Shielding installed, data taken in final configuration

* Since 2021