

LEGEND

Large Enriched
Germanium Experiment
for Neutrinoless $\beta\beta$ Decay

Raoul Cesarano

on behalf of the LEGEND local group

GSSI Science Fair

LNGS – 12/02/2026

The LEGEND project

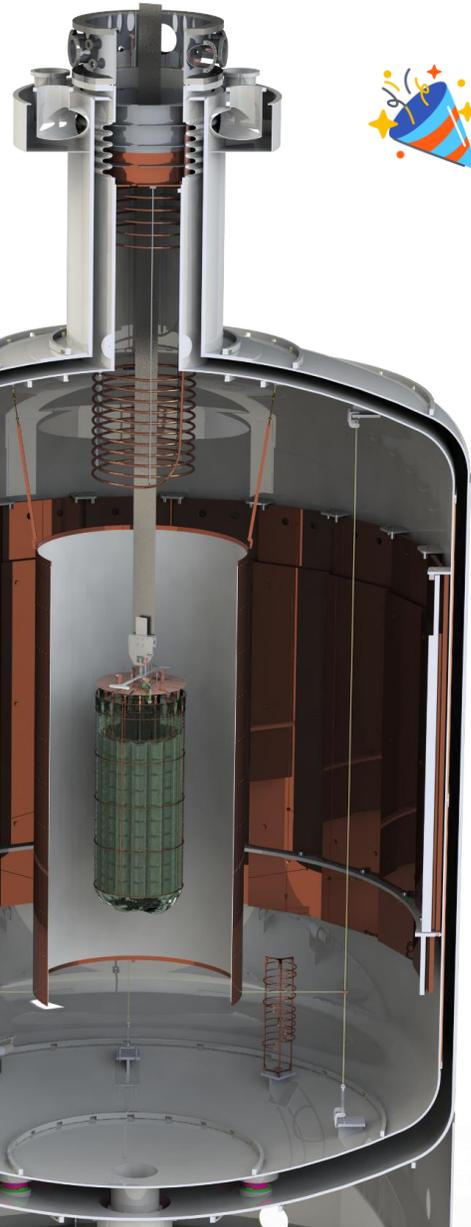


“The collaboration aims to develop a phased, ^{76}Ge based $0\nu\beta\beta$ experimental program with **discovery potential** $T_{1/2}^{0\nu\beta\beta} > 10^{28}$ yr, using existing resources as appropriate to expedite physics results.”

13 countries, 60 institutions, ~300 members



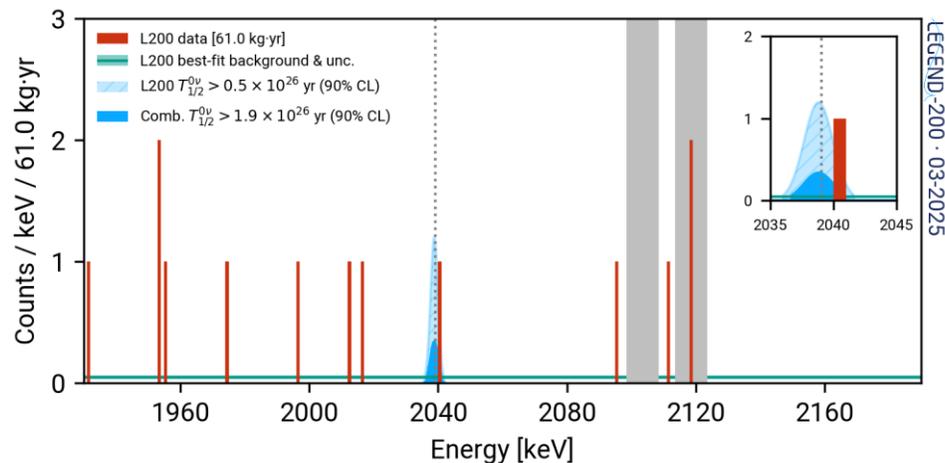
LEGEND – 200



Combined analysis with GERDA and MJD set
new limit on $0\nu\beta\beta$ half-life of 1.9×10^{26} yr
with **world-leading sensitivity** of 2.8×10^{26} yr

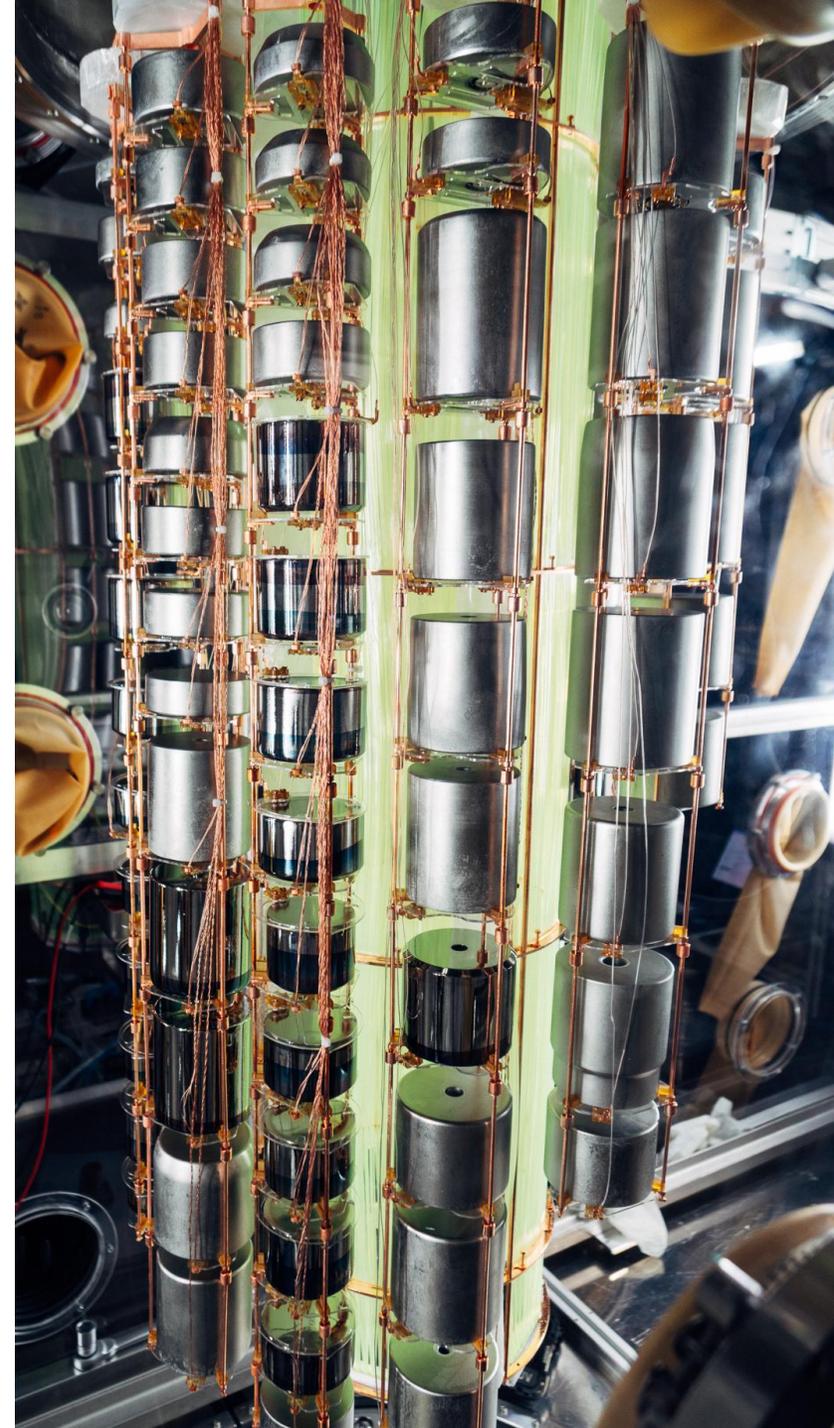


<https://doi.org/10.1103/25tk-nctn>



- **New deployment** of 132 kg HPGe
 - 35 kg of new IC detectors

PHYSICS DATA TAKING NOW!



LEGEND local group

- **Natalia Di Marco**

Physics Professor

- **Riccardo Biondi**

RTT

- **Valentina Biancacci**

PostDoc

- **Raoul Cesarano**

PhD student

- **Rita Feriozzi**

PhD student



- Michele Morella

PostDoc

- Valerio D'Andrea

Researcher

- Nina Burlac

PostDoc

- Małgorzata Harańczyk

PostDoc

- Krzysztof Szczepaniec

PostDoc

- Nicola Rossi

Researcher (PI)

- Matthias Laubenstein

Technologist

- Chiara Vignoli

Researcher



- Matthias Junker

Technologist

- Francesco Ferella

PostDoc

- Chiara Ghiano

Technologist

- Iza Kochanek

PostDoc

- Alessandro Razeto

Researcher

LEGEND – 200 Activities

Join any of the LEGEND - 200 groups:

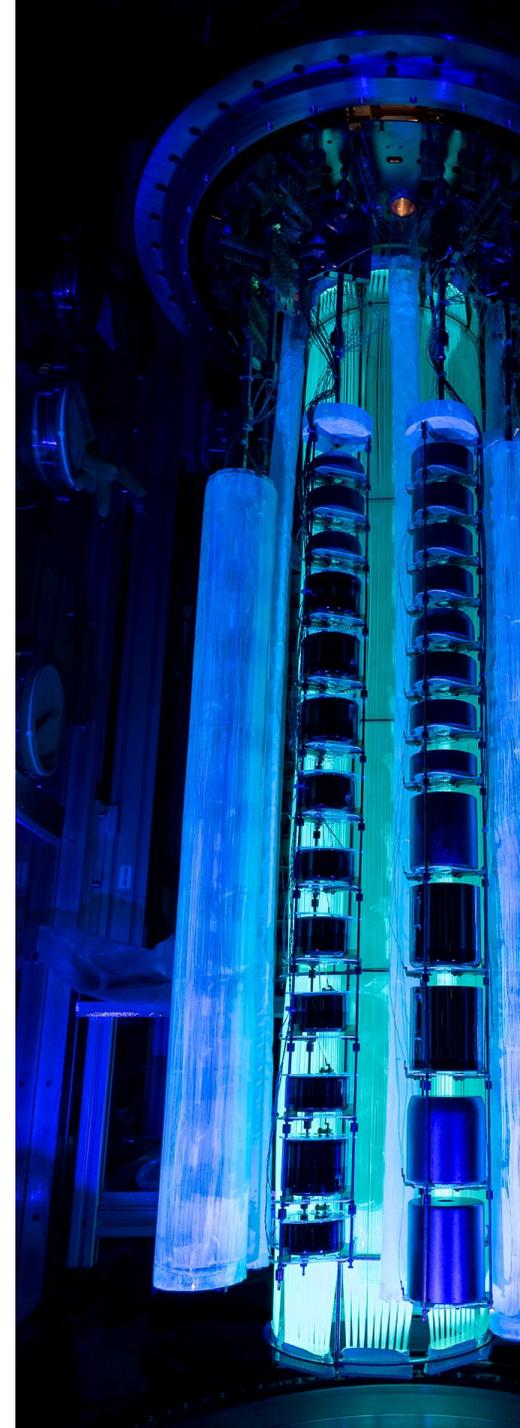
- Data quality and Monitoring
- Energy Scale (check the poster!)
- Pulse Shape Discrimination (check the poster!)
- Pulse Shape Simulation (check the poster!)
- Background modelling and simulations
- On site hardware operations

LEGEND -200 will be taking data during the entire period of your PhD!

Take part in one of the many **beyond $0\nu\beta\beta$ analysis**:

- Dark matter
- Axion searches
- **Baryon number violation**
- **Supernova neutrinos** (check the poster!)
- Electron decay
- Lorentz violation
- Majoron emission
- BSM searches in argon
- ... and more!

Publications and new results coming soon!



LEGEND₁₀₀₀ – 1000 Activities



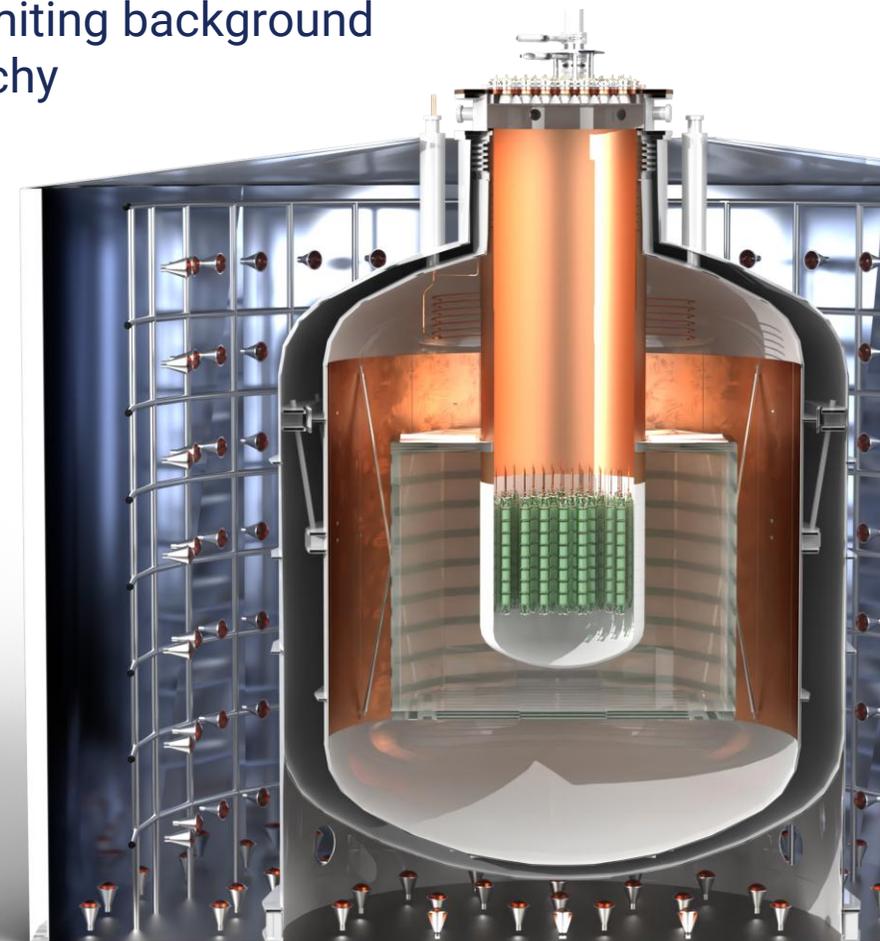
Contribute to **build the next generation experiment on $0\nu\beta\beta$** at LNGS

LEGEND₁₀₀₀ requires an **active neutron moderator** to tag neutron captures that produce $^{77(m)}\text{Ge}$, a limiting background to fully exclude the inverted hierarchy

Our group has the responsibility in the design and production of the LEGEND₁₀₀₀ **neutron moderator**

Characterization measurement will be performed in the **LEGENDArYno** test stand @LNGS (check the poster!)

Simulations are needed to finalize the neutron moderator design, choose the trigger scheme, optimize the readout, and assess Xe doping effects





Turn your PhD into
LEGEND