

# Laboratori Nazionali del Gran Sasso



Istituto Nazionale di Fisica Nucleare  
Laboratori Nazionali del Gran Sasso

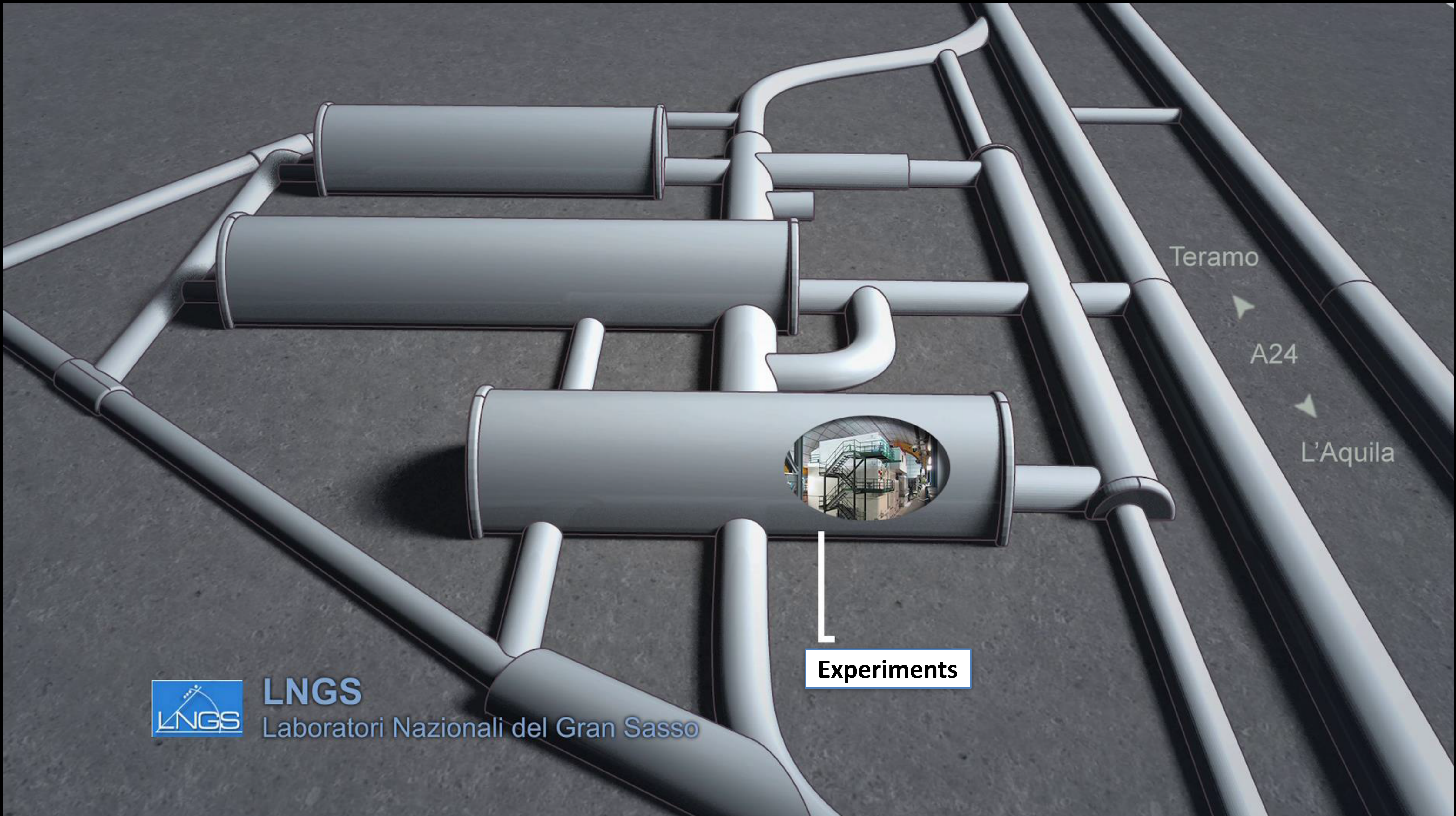






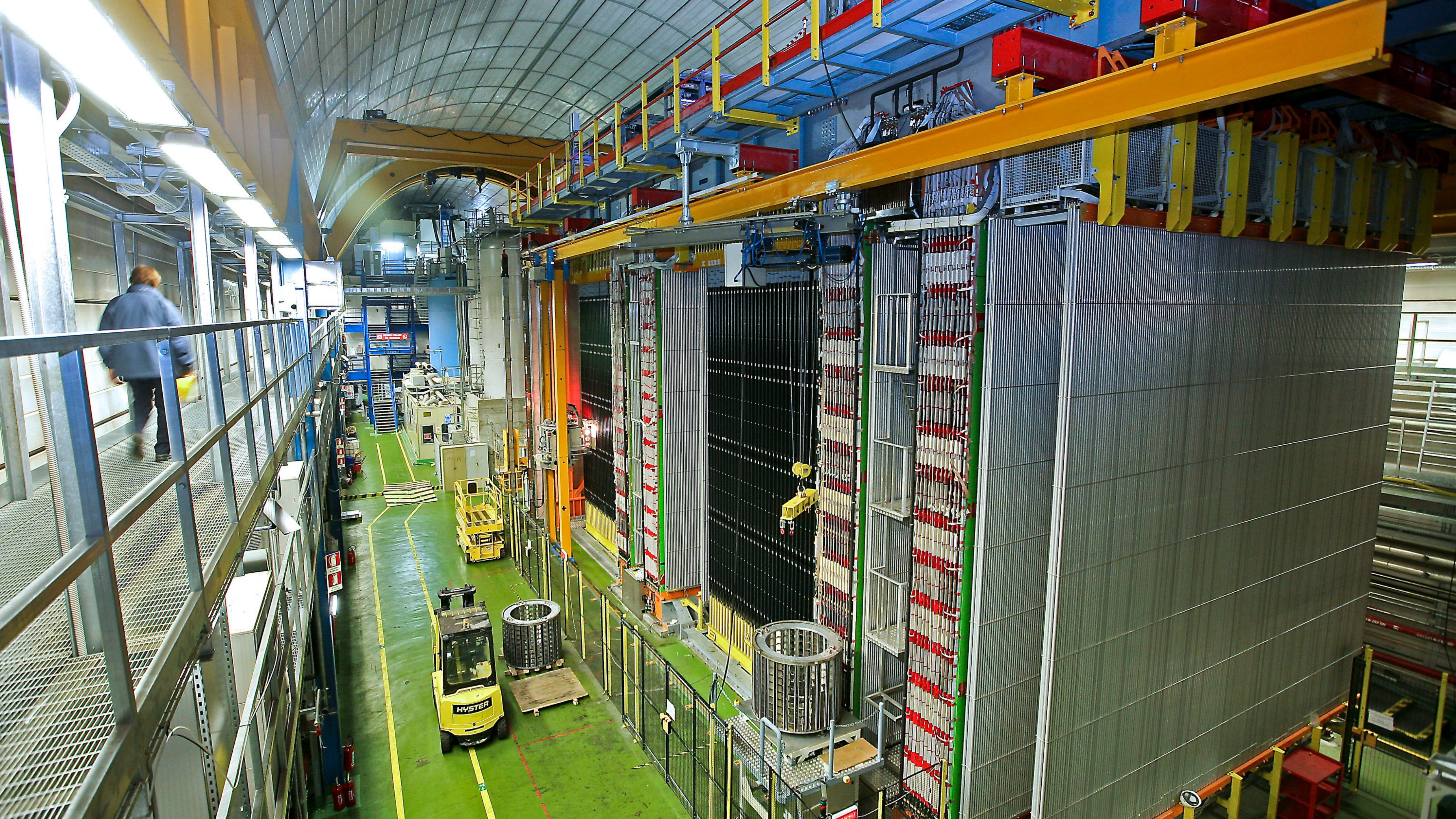




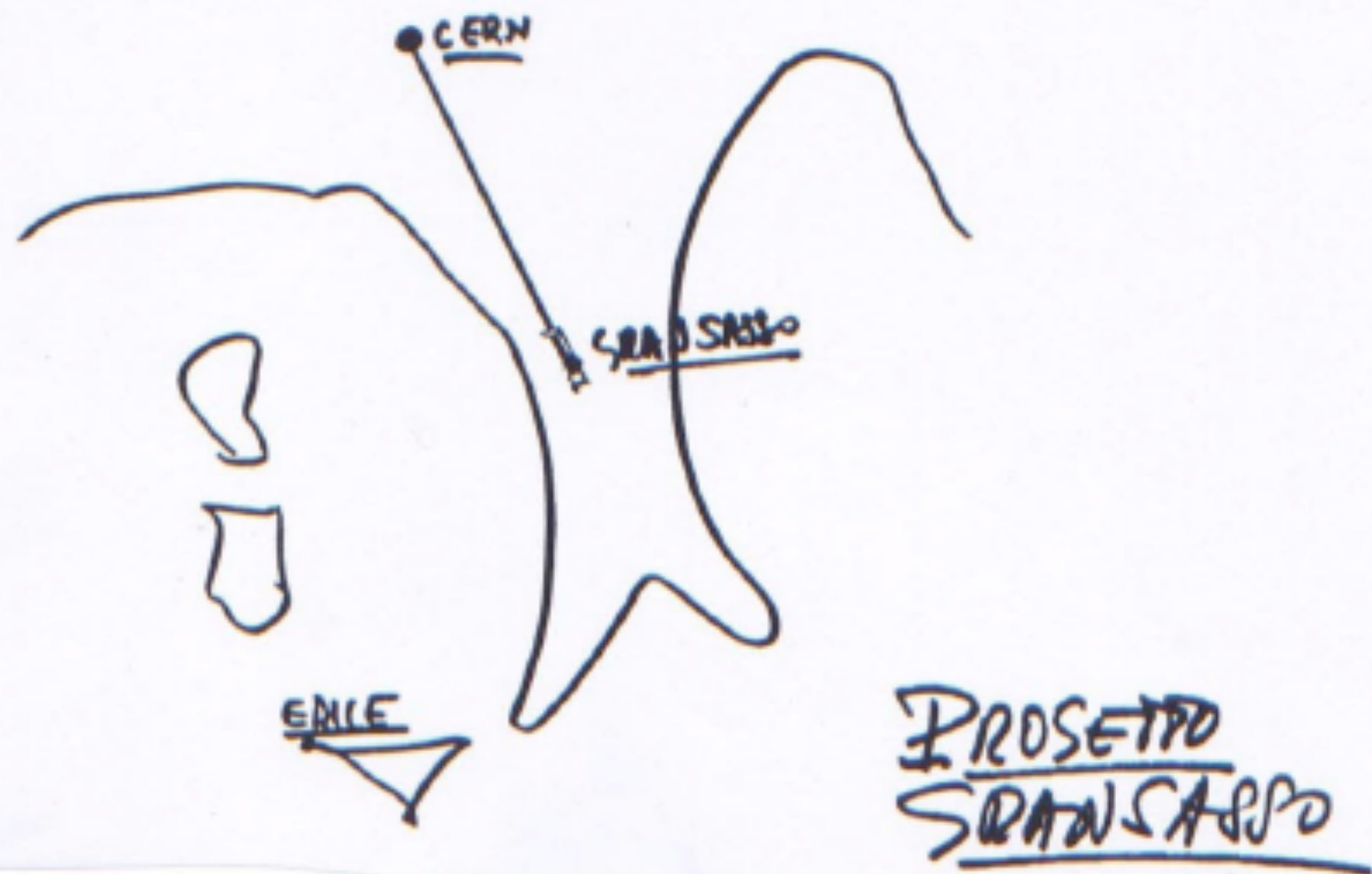


**LNGS**  
Laboratori Nazionali del Gran Sasso

**Experiments**



COMMISSIONE LAVORI PUBBLICI DEL SENATO

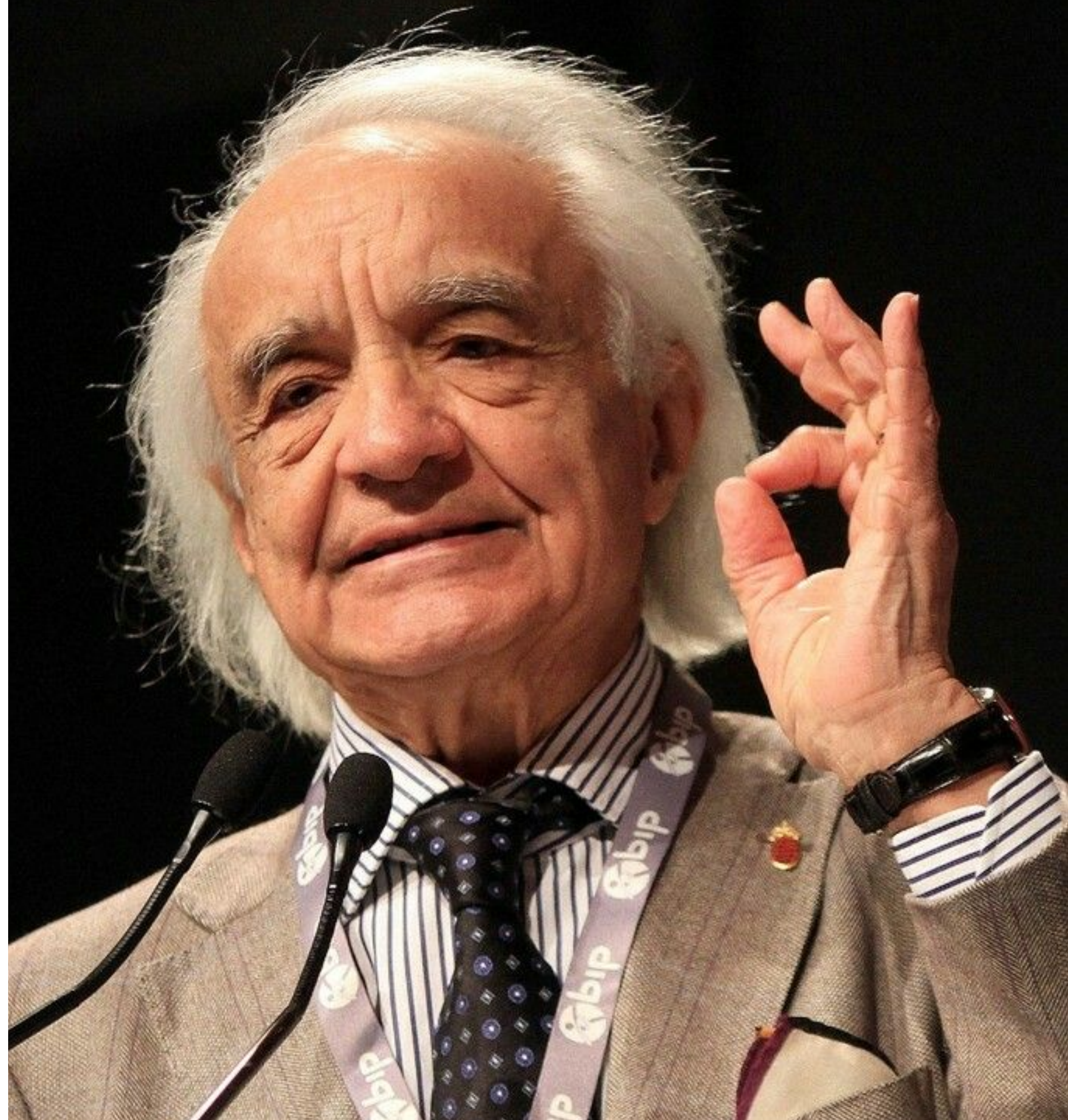


Note manoscritte di A. Zichichi presentate nella Seduta della Commissione Lavori Pubblici del Senato convocata con urgenza dal Presidente del Senato per discutere la proposta del Progetto Gran Sasso (1979).

To summarize, the scientific aims of the "Gran Sasso" laboratory are the study of:

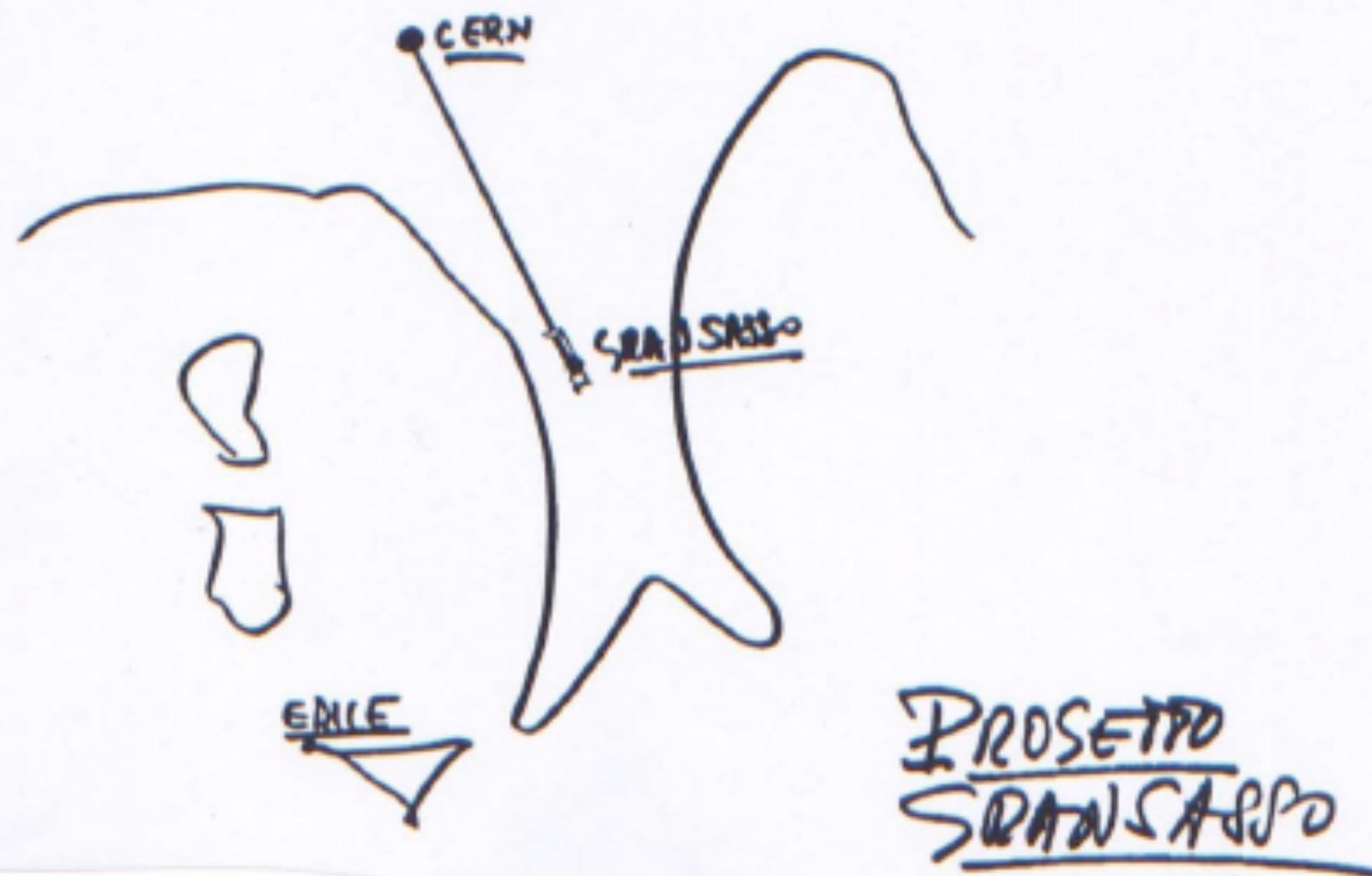
- 1) nuclear stability;
- 2) neutrino astrophysics;
- 3) new cosmic phenomenology;
- 4) neutrino oscillations;
- 5) biologically active matter;
- 6) ground stability.

Not only  
 $\tau_p \neq \infty$





COMMISSIONE LAVORI PUBBLICI DEL SENATO

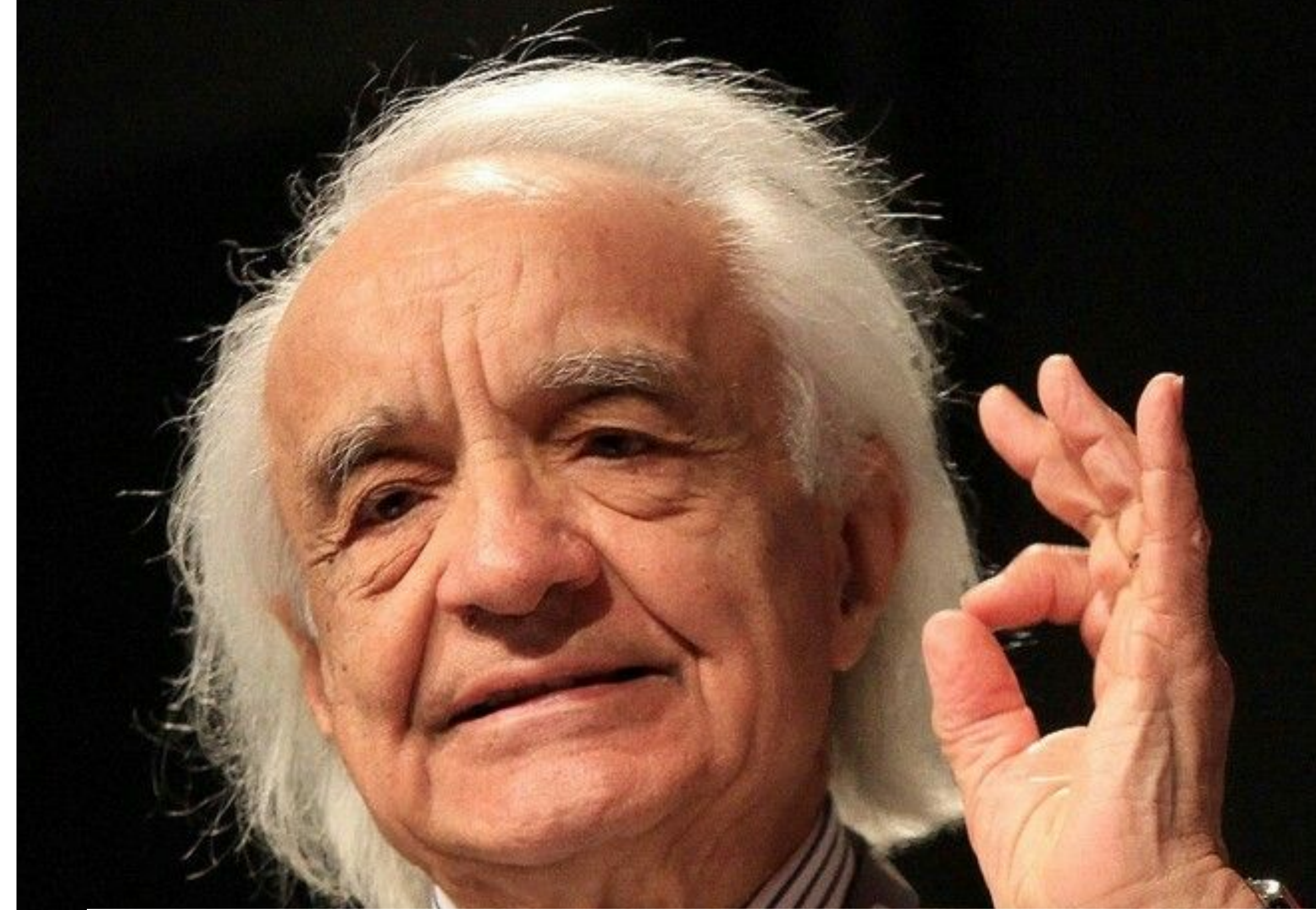


Note manoscritte di A. Zichichi presentate nella Seduta della Commissione Lavori Pubblici del Senato convocata con urgenza dal Presidente del Senato per discutere la proposta del Progetto Gran Sasso (1979).

To summarize, the scientific aims of the "Gran Sasso" laboratory are the study of:

- 1) nuclear stability;
- 2) neutrino astrophysics;
- 3) new cosmic phenomenology;
- 4) neutrino oscillations;
- 5) biologically active matter;
- 6) ground stability.

Not only  
 $\tau_p \neq \infty$



- 1979: proposal by A. Zichichi to Italian Parliament
- 1982: Approval of LNGS construction
- 1987: construction completed
- 1989: Start data taking of first large experiment (MACRO)

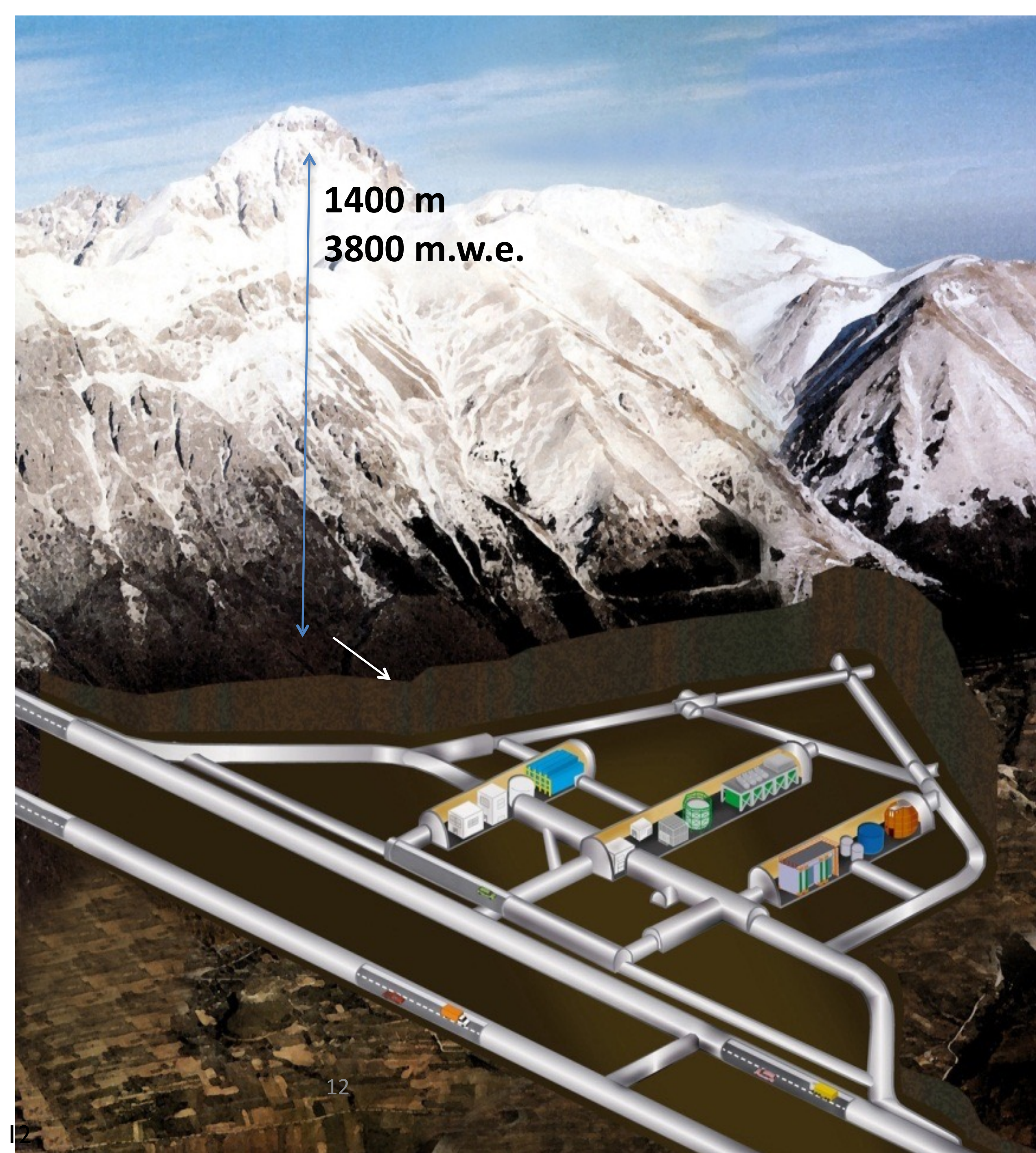






# The LNGS Underground Laboratory in numbers

- 1400 m (3800 m.w.e. vertical depth)
- Surface: 17 800 m<sup>2</sup>
- Volume: 180 000 m<sup>3</sup>
- Ventilation: 1 vol / 3 hours
- 3 large experimental halls (~100x20x18 m<sup>3</sup>)
- 22 experiments currently running
- Easy access through highway tunnel
- **World's largest operational Underground laboratory**



# LNGS people

**127** staff personnel

Direct connection with LNGS for associated members:



UNIVERSITÀ DEGLI STUDI DELL'AQUILA



**Technologists 42**

**Researchers 14**

**Technicians 43**

**Administrative staff 28**

LNGS involved people: **282**  
(**127** staff + **155** associated)



# Internationality of the Gran Sasso National Laboratory

Total involved scientists: **N. 1334**

Italian scientists: **N. 482**

Foreign scientists: **N. 852**

Scientific guests: **N. 505**

Italian guests: **N. 295**

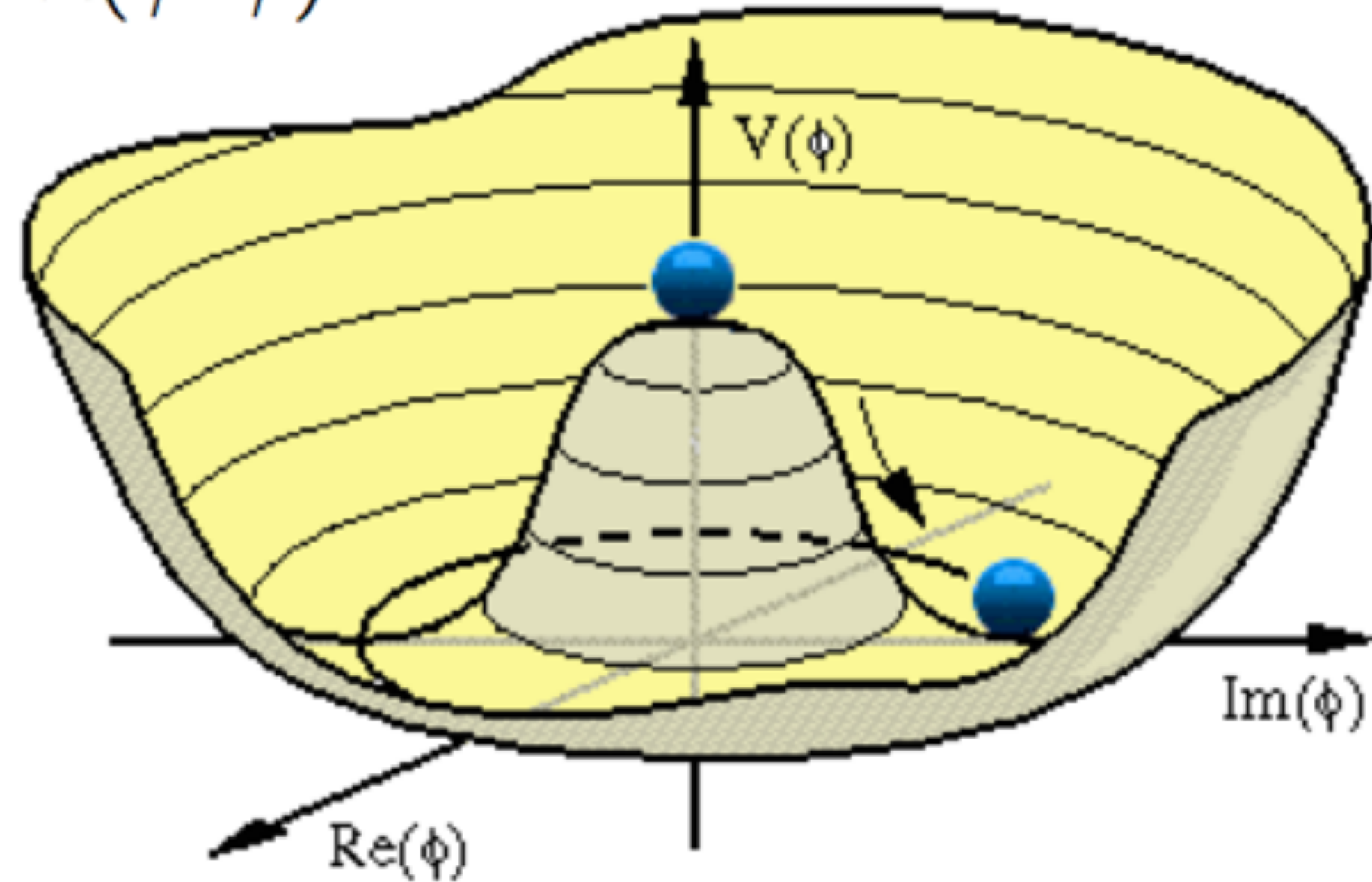
Foreign guest: **N. 210**







$$\begin{aligned}
\mathcal{L} = & -\frac{1}{4}F^{\mu\nu}F_{\mu\nu} - \frac{1}{4}G^{A\mu\nu}G_{\mu\nu}^A - \frac{1}{4}W^{A\mu\nu}W_{\mu\nu}^A \\
& + i\bar{Q}_L^i \mathbf{D}_C Q_L^i + i\bar{u}_R^i \mathbf{D}_C u_R^i + i\bar{d}_R^i \mathbf{D}_C d_R^i + i\bar{L}_L^i \mathbf{D}_C L_L^i + i\bar{e}_R^i \mathbf{D}_C e_R^i \\
& - \Gamma_u^{ij} \bar{Q}_L^i \epsilon \phi u_R^j - \Gamma_d^{ij} \bar{Q}_L^i \phi d_R^j - \Gamma_e^{ij} \bar{L}_L^i \phi e_R^j - (\leftarrow)^\dagger \\
& + (\mathbf{D}^\mu \phi)^\dagger \mathbf{D}_\mu \phi + \mu^2 \phi^\dagger \phi - \lambda(\phi^\dagger \phi)^2
\end{aligned}$$



# LNGS main research activities

- Neutrino Astrophysics
- Neutrino Physics
- Dark Matter searches: particle physics, astrophysics, cosmology
- Nuclear Astrophysics:
  - Study of Nuclear reactions relevant to Big Bang Nucleosynthesis and Star Nucleosynthesis

# And more...

- Material science
  - Ultrapure crystals for DM and DBD
  - Ultrapure materials
- Geophysics and geology
  - Highly reduced seismic noise environment
  - Underground water, trace radioactivity
  - Antineutrinos from the earth
- Biology
  - Study of the effects of very low radioactivity doses on living organisms
- Gravitation and general Physics



hermelin

8 37 38 39 40 41 42 43 44 45 46 47 48 49 50

1 12 13 14 15 16 17 18 19 20 21 22 23 24 25



hermelin



Enrico Bellotti (1940-2021)  
first LNGS director







