

ULISSE Project

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U L S S E

UN AUTRE REGARD SUR L'UNIVERS

AN OTHER VIEW ON THE UNIVERSE

ULISSE 2ND Workshop, Modane October, 2009





Laboratoire Souterrain de Modane

past, present



.....and FUTUR





Second ULISSE workshop

Goal of the workshop:

Presentation of the project, status, schedule

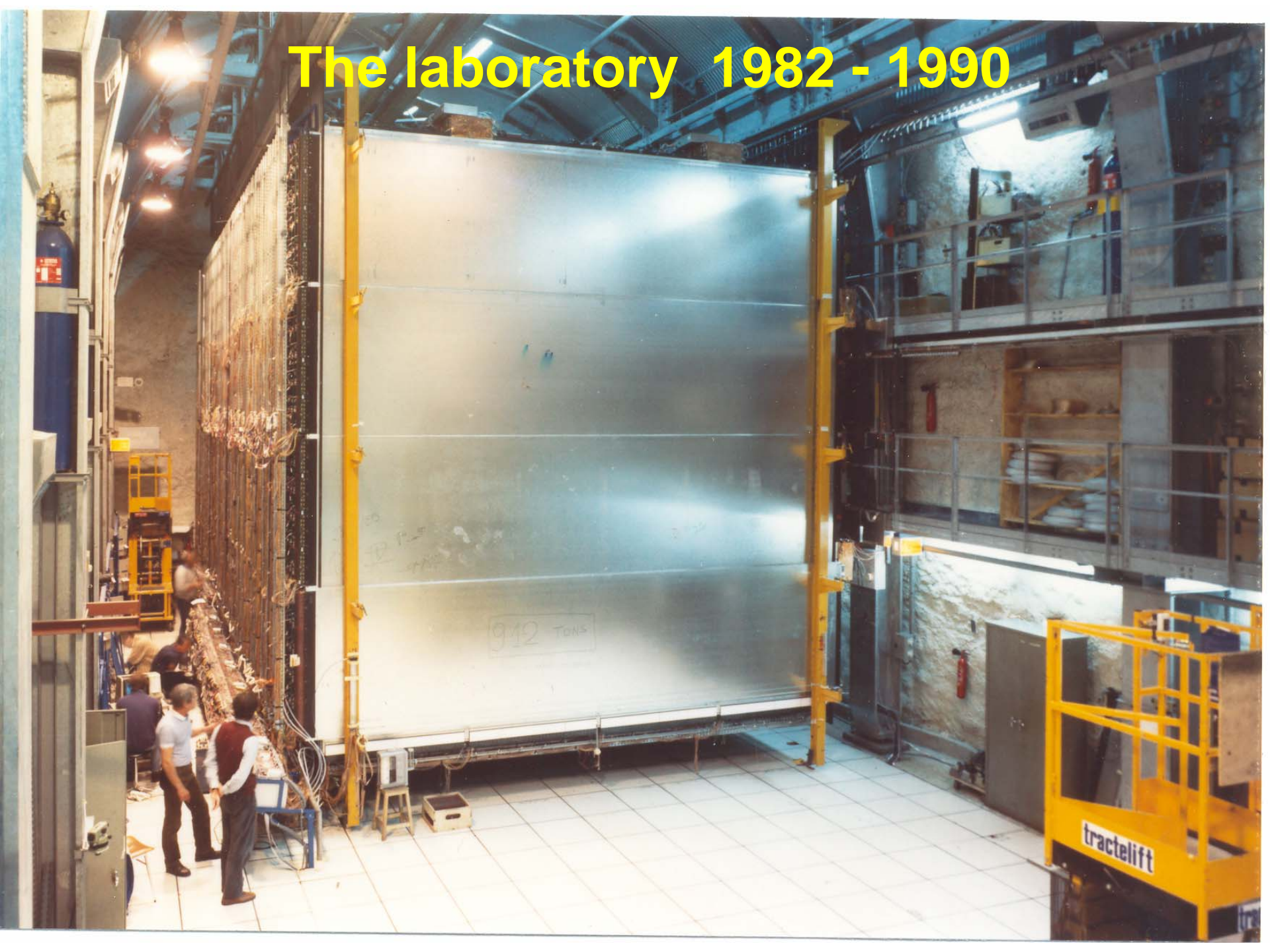
Presentation of LoI for the possible scientific program

To inventory the requests from the possible users:

- Space
- Size of the cavity
- Infrastructures (clean room, water purification, radon free air, electrical power....)
- Estimation of laboratory cooling capacity required
- Infrastructure outside
-

An independant Scientific Advisory Committee will make recommendation about the project and the possible scientific program

The laboratory 1982 - 1990

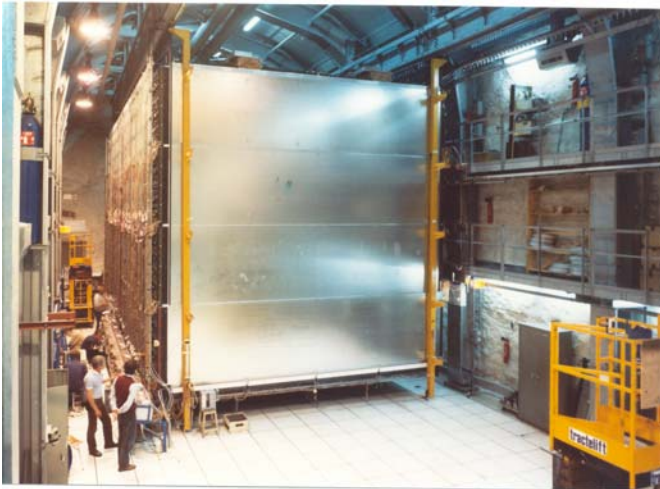




From 1980 - 1980

LSM has been digged in 1981 when the Fréjus roadway tunnel has opened

(with the safety gallery, the history repeat itself)



1982 – 1988

τ_p experiment: limit on proton decay
 $\sim 10^{31}$ years with iron calorimeter
(at the level of IMB and Kamiokande)
study of atmospheric neutrinos
and high energy muons

1986- 1990: first double beta decay experiment with ^{76}Ge (Bordeaux-Zaragoza)
best limit at that time

The laboratory 1991- 2000



Double beta decay

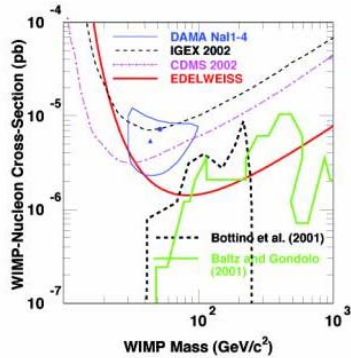
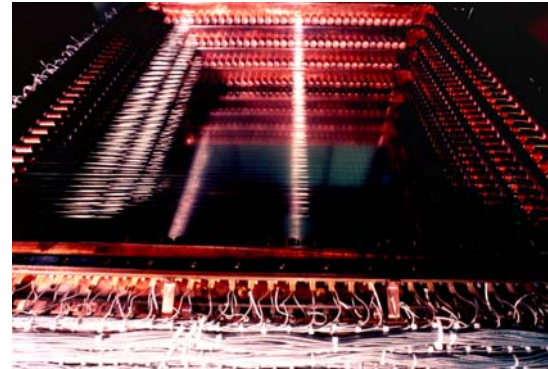
1989 -1990 : NEMO1 prototype

1991 – 1998 : NEMO2

$\beta\beta_{2\nu}$ half-life for ^{100}Mo , ^{82}Se , ^{96}Zr

1995: TGV experiment ^{48}Ca

1998: First observation of $\beta\beta_{2\nu}$ to excited state for ^{100}Mo with Ge detector



Dark Matter

1992 – 1996: NaI experiment for DM search

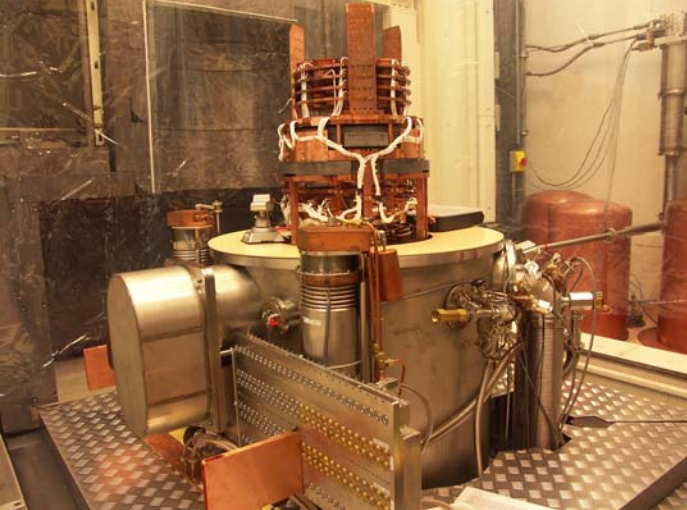
1996 - : EDELWEISS I

Low radioactivity measurements

1990 - Installation of Ge detectors for low radioactivity measurements:
 Material selection
 (Bordeaux, Lyon, College de France)
 environmental measurement
 (Gif/Yvette, IRSN, DASE)
 Expertise

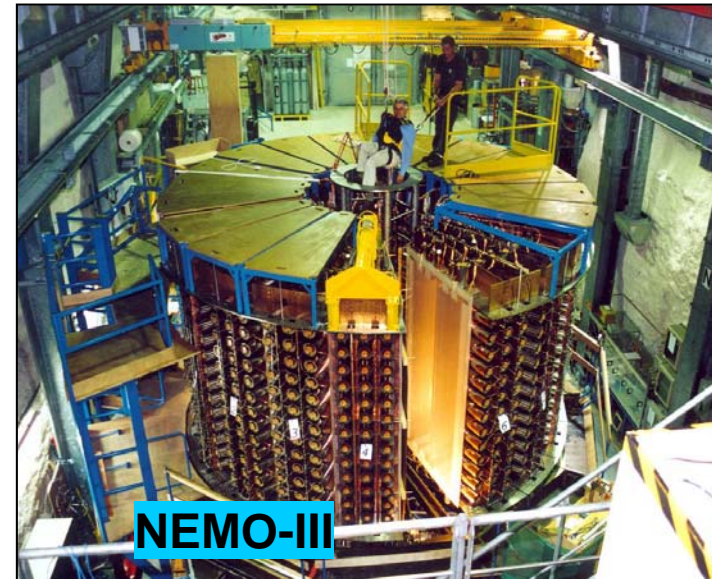


The laboratory 2000- ...



Double beta decay NEMO-III (tracking + calorimeter - ^{100}Mo 7 kg)

Dark Matter EDELWEISS-II (10 to 35 kg Ge heat+ion)

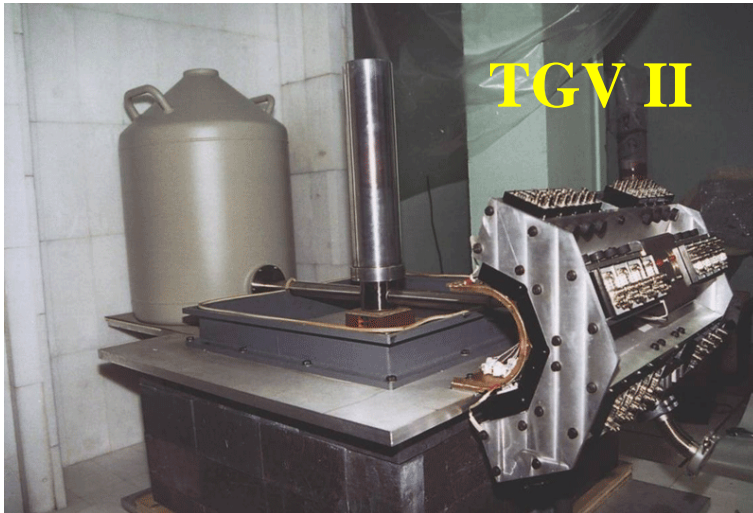




The LSM today

Double EC TGV-II (Ge with sheets of Double EC candidates)

Heavy elements SHIN (super heavy elements in nature, $Z=108$, $A=280$)



SHIN



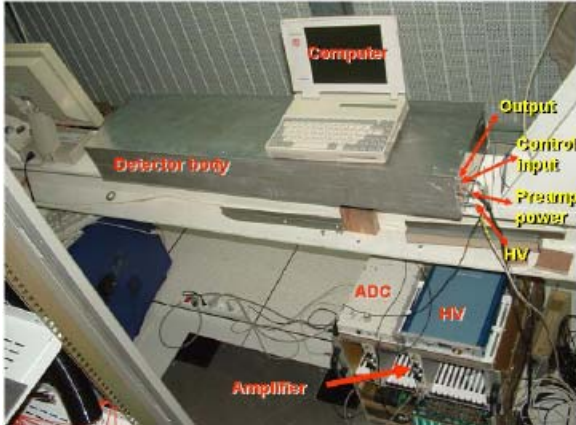
BiPo (related to SuperNEMO)

Radon detectors Saga University (Japan) and Dubna (Russie))



The LSM today

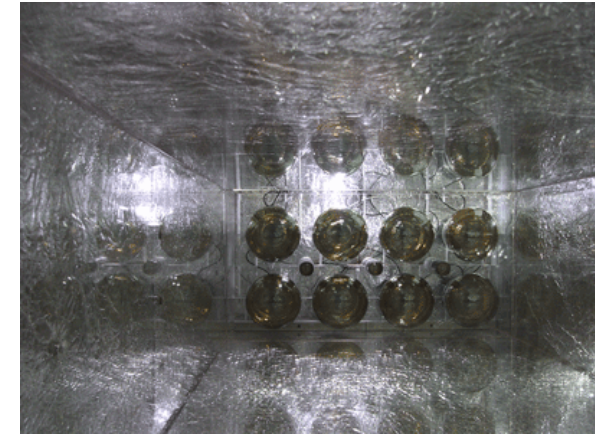
Neutron detectors at LSM



^3He counters



Sphere TPC



Gd loaded liquid scintillator

Support from ILIAS TARI for the 3 detectors

Logical test Failure



LSM is reference lab for JEDEC norm



13 HPGe from 6 different laboratories



- **Material selection for astroparticle physics,**
- **Environnemental measurements**
- **Applications (wine datation, salt origin,...)**
- **Developements of Ge detector**

LSM has developed Ge detector with Canberra-Eurysis in the frame of ILIAS European program

New Ge detector from CTU in Prague and JINR Dubna soon !



Last 5 years highlights

Development of new activities

JOULE 1 agreement with JINR Dubna 2005- 2008

Neutron and radon detectors, NEMO3, EDELWEISS, TGV and SHIN

JOULE 2 agreement with JINR Dubna and CTU Prague

Neutron and radon detectors, anti-radon facility, NEMO3, EDELWEISS, TGV, SHIN, Pixellized detectors

Participation to ILIAS program

Network of underground laboratories (participation to CoMAG board of lab director)

Joint Research Activity development of Ge detectors

Transnational Access: 540 visitor days for 10 projects

Own research activity for the lab with a permanent physicist (Pia Loaiza)

Ge detectors development and low background techniques

Staff of 2 physicists, 2 engineers, 7 technicians



New External building

New infrastructure for offices, workshop, outreach space





An unique opportunity

- Deepest site in Europe (4800 mwe) (Deepest in Pyhasalmi mine is deeper)
- Known and « good » site (low convergence, dry, stiff rock)
- Central location in Europe, easy access (plane, train car)
- 23 years experience in running such platform
- Independent, convenient, safe, horizontal access
- European Roadmap new projects (SuperNemo, EURECA, XENON, COBRA ...)
- Italo-french intergovernmental green light to start work
- Integration of project to tunnel company planning and constraints
- Performed pre study : moderate cost

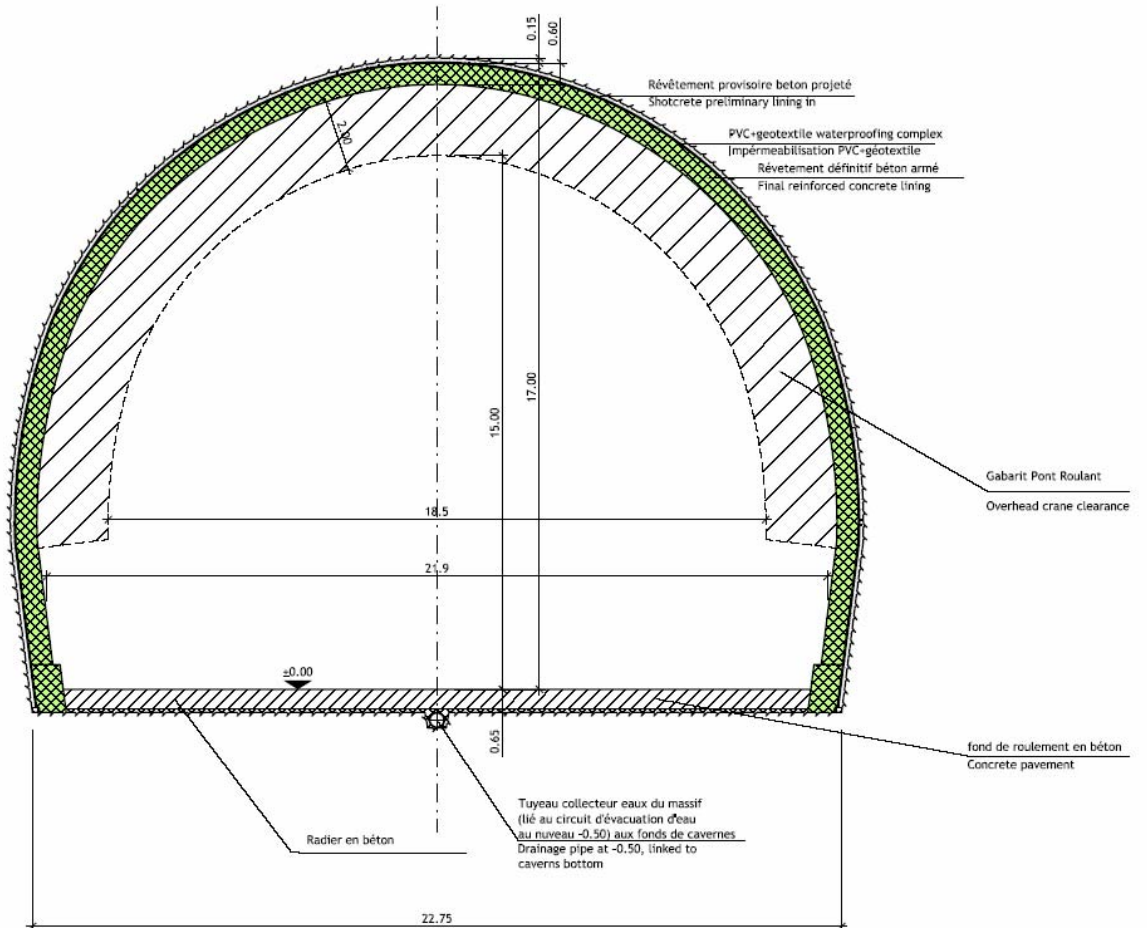
Minimum scenario: 8 M€ for 40 000 m³ cavity

3 M€ for equipments (electrical power, ventilation, cooling)



COUPE TYPE SALLE A
SECTION EXCAVÉE 375 m²
SECTION UTILE 320 m²
1:100

CAVERN A CROSS SECTION
EXCAVATED AREA 375 m²
INTERNAL CLEARANCE 320 m²
1:100



Opportunity to built an european facility

Ranked as priority in the french roadmap for Very Large Infrastructure

Scientific program covers 3 of the seven magnificients of ASPERA roadmap:

Neutrino mass and properties → Double beta decay

Darl matter search → WIMPS

Proton decay and neutrino physics with megaton scale detector

Opportunity to develop low background techniques and applications

Logical failure tests

12 Lol received and one Expression of Interest

Double beta decay:

SuperNEMO (tracko-calorimetry method)
COBRA (solid TPC)

Dark matter:

EURECA (Bolometers)
DARWIN (noble liquid) Eol
MIMAC (TPC)
ULTIMA (Superfluid ^3He)

Double EC

TGVIII Double EC (pixelized detector)
Double EC with Ge detectors

R&D for proton decay and neutrino physics

MEMPHYNO

Supernovae neutrinos:

TPC sphere

Logical test failure

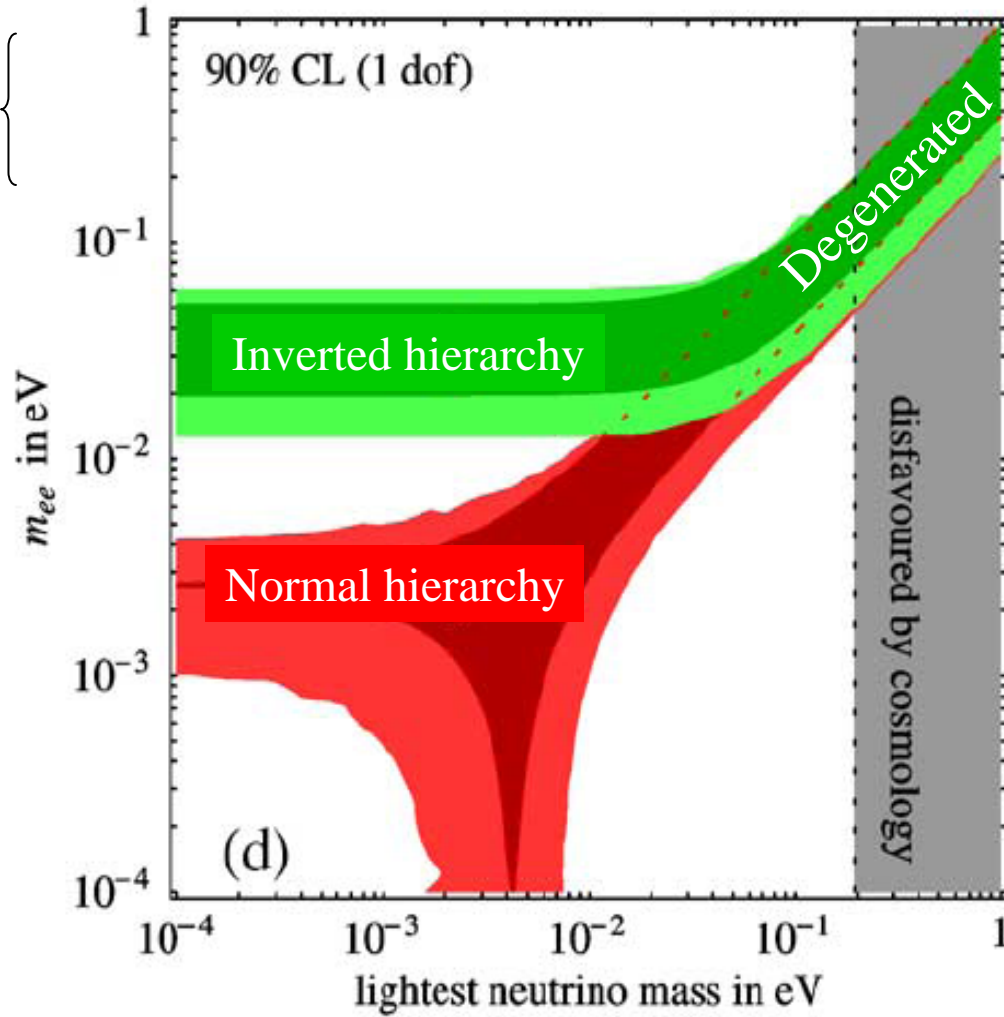
Low background techniques

:Environmental measurement

Sediment in alpine lakes

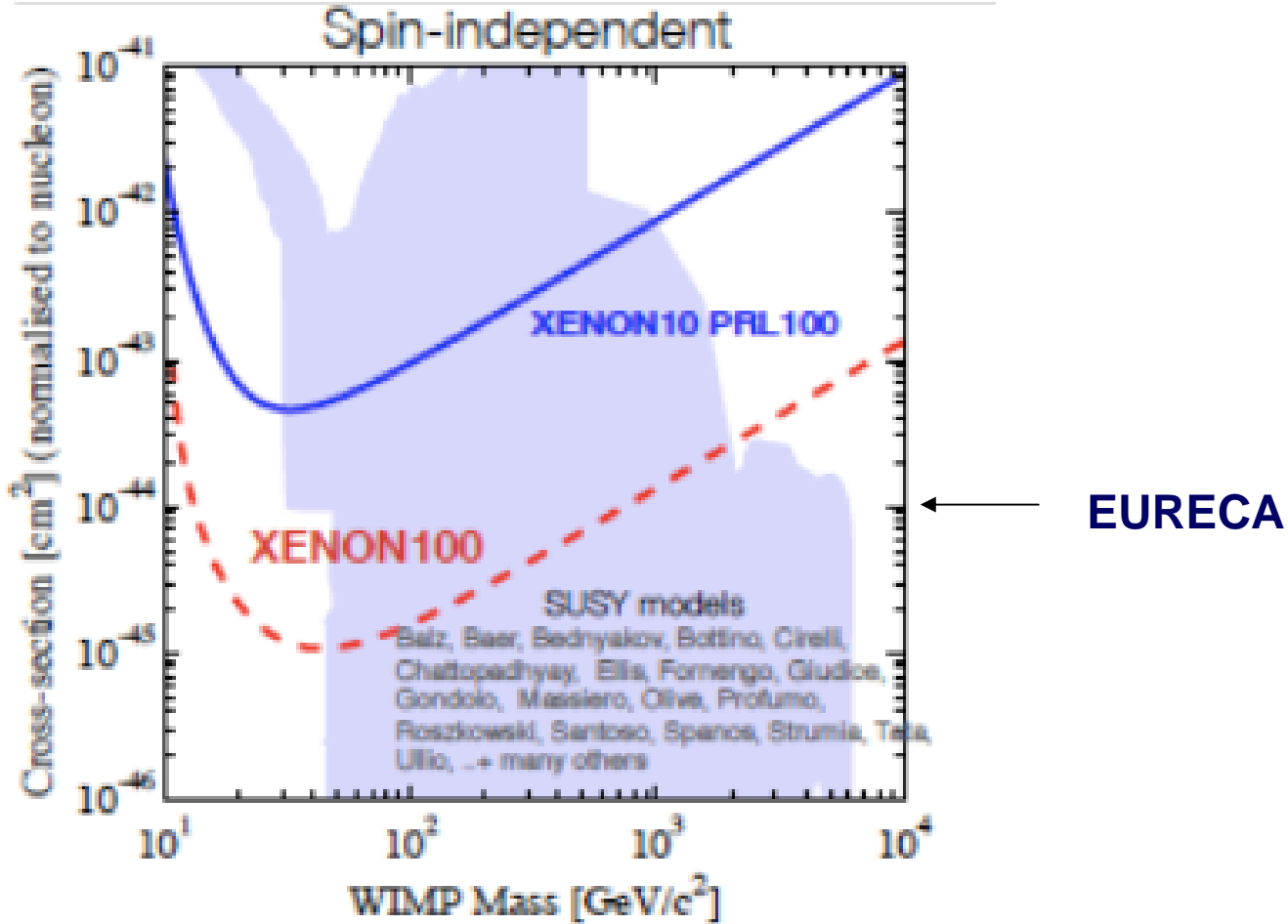
ULISSE DBD potential

H-M, Cuoricino
NEMO 3



SuperNEMO,
 Gerda, Cuore,
 Cobra?;;;

ULISSE DM potential



Supported by CNRS and CEA

Supported by Région Rhône-alpes and Département de Savoie

Potential international partners

2007: Preliminary study funded by France and UK

Funds from Région Rhône-Alpes and Département de Savoie for detailed study

May 2009: Contract signed by the tunnel for the safety gallery

October 2009: Complement of pre-study to have better cost estimation

End of 2009: recommendation by SAC

2010: detailed study

Absolute constraint: Option must be confirmed before May,18 2011

Cost scenario: minimum 8 M€ for the 40 000 m³ cavity (100 m long)
(CNRS, CEA, Région Rhône-Alpes, département de Savoie, french state)

3 M€ for equipment (other international partners)

If more money can be obtained (we have right to dream), cavity size can be fitted with the available funds (190 m long → 19 M€)

Decision for funding in France soon ?

To have a chance to get european funds need of a consortium agreement

ULISSE is now entering in a critical phase

Deadline for the option May18 2011

**This is the only opportunity to extend the lab at low cost.
A step for a future megaton site ?**

This infrastructure will be operated for at least 30 years.

There is a very attractive scientific program at middle term

Thanks to steering committee members, to the collaboration submitting the Lol and Eol, to the SAC members and to all the participants of this workshop