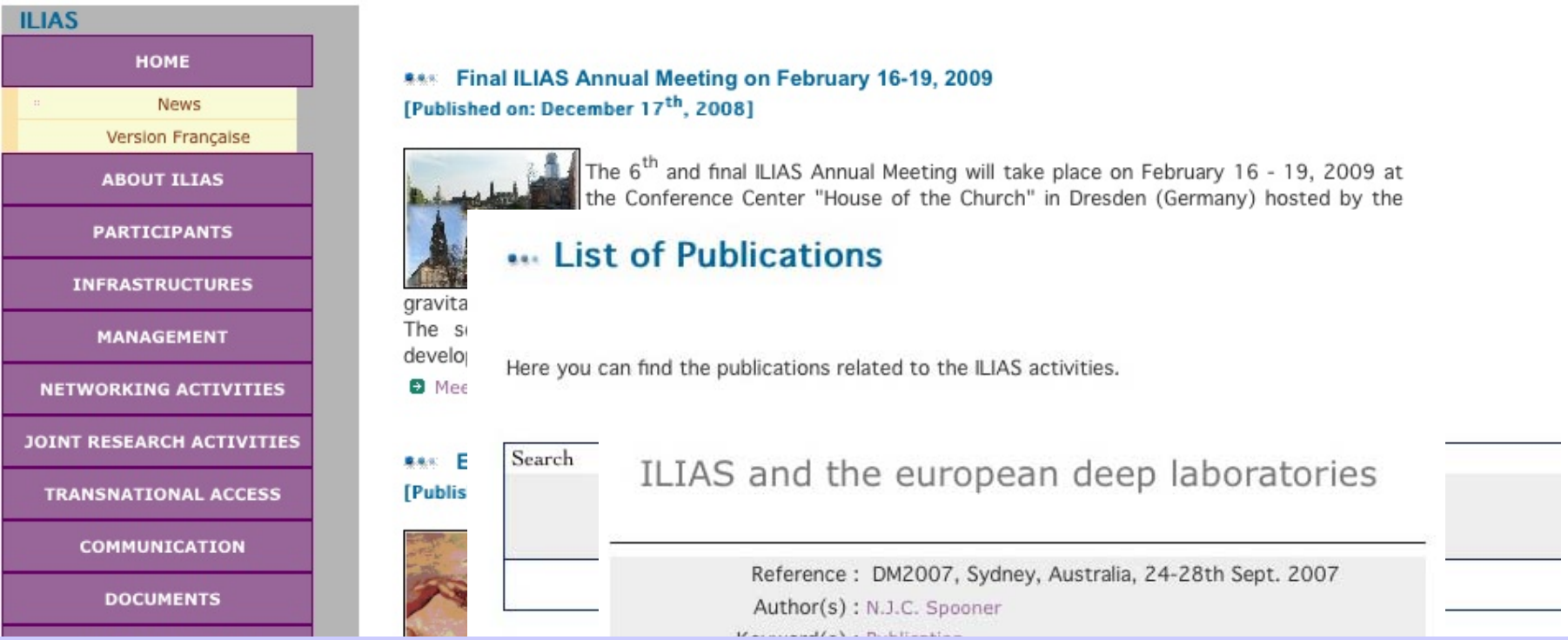
Outreach and communication

OUTLINE:

- ILIAS outreach and dissemination
- Outreach activities of the underground Labs
- N2 Communication and outreach activities

ILIAS outreach and dissemination

ILIAS website



ILIAS website updated sep2006 for a more dynamic and ergonomic structure

- News
- Description of partners and activities
- Communication and ILIAS meetings
- 523 ILIAS publications and conferences so far in searchable database with abstract and link to full text
- Links => all ILIAS related web sites

DOCUMENTS

Astroparticle Booklet

ILIAS posters

Chambéry Annual meeting proceeding

European Physical Journal A

EPJ manuscript No.
(will be inserted by the editor)

Neutron- and muon-induced background in underground physics experiments

V. A. Kudryavtsev[1], L. Pandola[2], and V. Tomasello[1]

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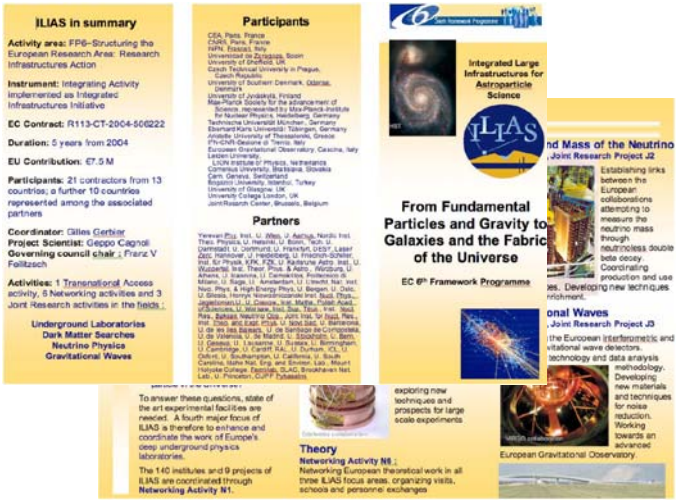
Received: date / Revised version: date

Abstract. Background induced by neutrons in deep underground laboratories is a critical issue for all those experiments looking for rare events, such as dark matter interactions or neutrinoless $\beta\beta$ decay. Neutrons can be produced either by natural radioactivity, via spontaneous fission or (α,n) reactions, or by interactions initiated by high-energy cosmic rays. In all underground experiments, Monte Carlo simulations of neutron background play a crucial role for the evaluation of the total background rate and for the optimization of rejection strategies. The Monte Carlo methods that are commonly employed to evaluate neutron-induced background and to optimize the experimental setup, are reviewed and discussed. Focus is given to the issue of reliability of Monte Carlo background estimates.

PACS. 98.70.Sa Cosmic rays 98.70.Vc Background radiations 95.35.+d Dark matter 23.40.-s Double beta decay

ILIAS Flyer



Thanks to the participation of all ILIAS activities

EVENTS

Annual meetings

Association of local authorities

Exhibitions

Press conferences

Public lectures

Participation to events related to research infrastructures

Exhibition at :

- ESOF EUROSCIENCE OPEN FORUM Barcelona, July 18-22, 2008

Meetings :

- RADIONET meeting, 21 April 2006, Volterra
- CERN Symposium, 12 June 2006
- HEAPNet meeting, 19-20 February 2007, Amsterdam - NIKHEF
- I3-NET meeting, 7 November 2006, London
- ASPERA Outreach meeting, 21 June 2007, Hamburg (DESY)
- I3 Forum 7th Meeting - 18th July 2007 Brussels
- …

FILMS

"Particle Hunters – in search of the Dark Matter of the universe"
Include animations, interviews, visit of underground labs, CERN

http://ice.unizar.es/particles/

Ongoing :

- Film for the general public advertising ILIAS
- Series of documentaries presenting the European underground laboratories and their research

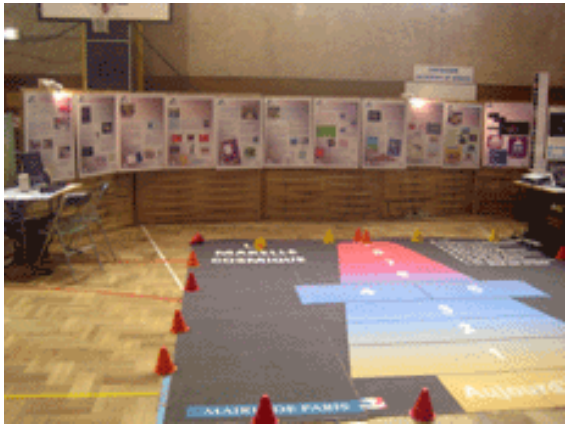
Outreach activies of the underground Labs

Modane Underground Laboratory

LSM participated in *Fêtes de la Science 2008*, where the companies and laboratories in the region show their activities.

The physicits explain some topics of the research at lab, for example the radioactivity

Archeological lead from 400 b.C. used for shielding (property of LSM)



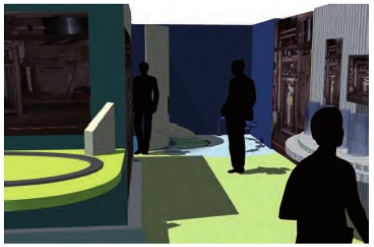
Game: from nowadays to the Big-Bang

PC with interactive animations

Posters and exhibition

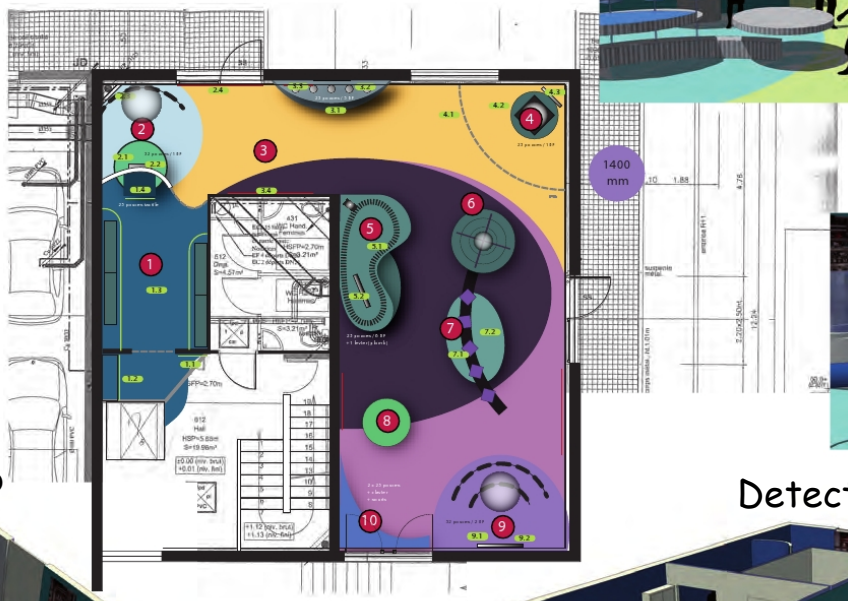
Modane Underground Laboratory

Interactive exhibition in the new LSM building: foreseen to be ready in June 2009



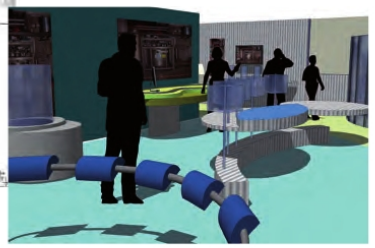
Film on experiments in the lab

Radioactivity train: show the natural radioactivity interactively

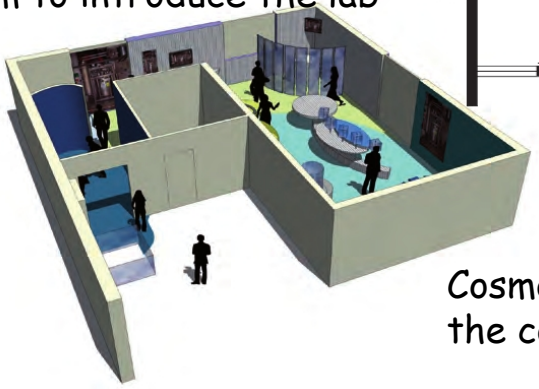


Cloud chamber

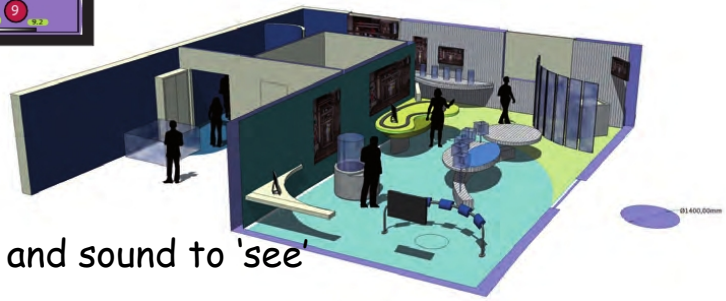
Historical objects



Film to introduce the lab



Detection and Detectors



Cosmophotophone: light and sound to 'see' the cosmic rays

The Canfranc Underground Laboratory

During the last year the LSC was closed, so no outreach activities were carried out.
Anyway, the installation of new experimental facilities will open many outreach opportunities for LSC during the next years...

Colleagues from the University of Zaragoza have always been participating in the most relevant ILIAS outreach activities
- LNGS Open Day 2008
- ILIAS Film
- ESOF 2008

"Conversi Spark Chamber" (Hodoscope)

ESOF 2008: "... a unique opportunity to influence the future of science in Europe..."
Presented ILIAS posters, a large number of ILIAS brochures were distributed, and the film cofinanced by ILIAS "Particle hunters. In search of the Dark Matter of the Universe" was shown with a great success!

Boulby Underground Laboratory

A new coordinated outreach programme involving representatives from each of the science programmes and the Boulby mine operators (Cleveland Potash Limited - CPL).

This programme involves:

- a series of talks
- displays
- open days

for the general public and special interest groups – at first locally focused then expanding outward.

Talks about the search for Dark Matter at Boulby held in local villages and towns (definitely well received - 80 to 120 people attending each of the 4 talks so far).

4 more planned (for this February and March - the March dates coinciding with UK's National Science week).

ILIAS-LABS Outreach:

- *2 Members of the Boulby team came along to the Gran Sasso Open Day in May 08*
- *Hosted the team for filming at Boulby in October 08 to realize an outreach film focused on underground physics in Europe.*
- *Aim at maintaining the ILIAS-Lab link in the BUS2009 workshop - inviting colleagues and organizing talks on present status and further strategy to communicate / collaborate on outreach and beyond.*

Gran Sasso National Laboratory: outreach activities

Didactic Laboratories

"Anch'io scienziato"

Among the initiatives, the prize given for the best scientific project produced within the school competition "I'm a scientist too…". 49 classes (about 1170 students) took part in the competition.

LNGS visits

Gran Sasso – South Dakota - Princeton Summer School

3 weeks stage in the Princeton University Campus

physics, astrophysics, english courses, experimental laboratories, etc…

OPEN DAY @ LNGS

To properly answer the requests of a wide range of public, special initiatives have been proposed.

- "**OPEN DAY**" – 7th edition

- seminars and discussion with the scientific community of the LNGS
- entertainment: learn physics, participate in experiments to explain daily life phenomena
- concerts, jugglers shows, etc...

OPEN DAY @ LNGS

- Posters and videos describing location and activities of ILIAS
- Distribution of brochures and leaflets
- Introduction to the ILIAS underground Labs (IUS, LSM, LSC, LNGS) activities

The main purpose of the OPEN DAY is to approach the public, in particular to introduce young people to science.

Different strategies to get people to know the scientific aspects of the world (play with "toys", analysis of common fenomena, show physics experiments, …)

2008 huge success: over 2000 visitors!!!

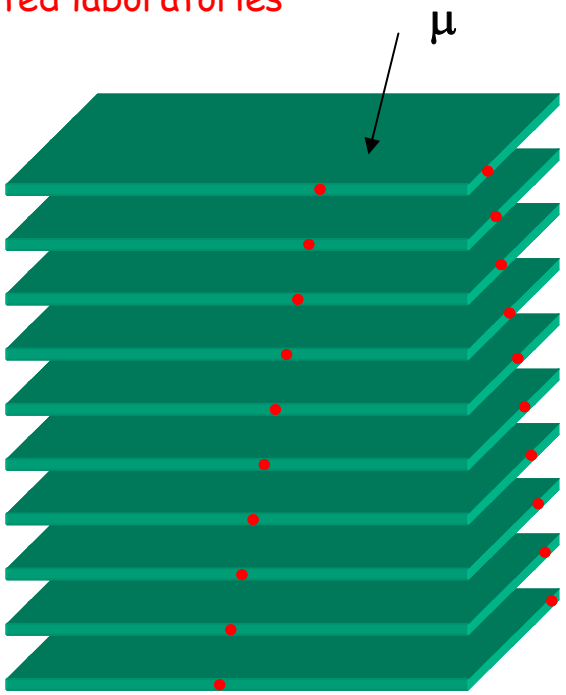
A Compact Cosmic Ray Telescope for outreach activities

• The CCRT is a portable tracking system for penetrating particles (i.e. muons) induced by primary cosmic ray interactions.

• Used in schools and in scientific outreach events

• It is converting crossing particles into light tracks that people can see as the proof of the existence of the subatomic world.

• Possible to share the device/experiences with other interested laboratories



Outreach activity at Virgo

Site Visits

During the school year (October-June), almost every Saturday morning there are one or two classes visiting Virgo, in Cascina, near Pisa

Exhibitions and shows

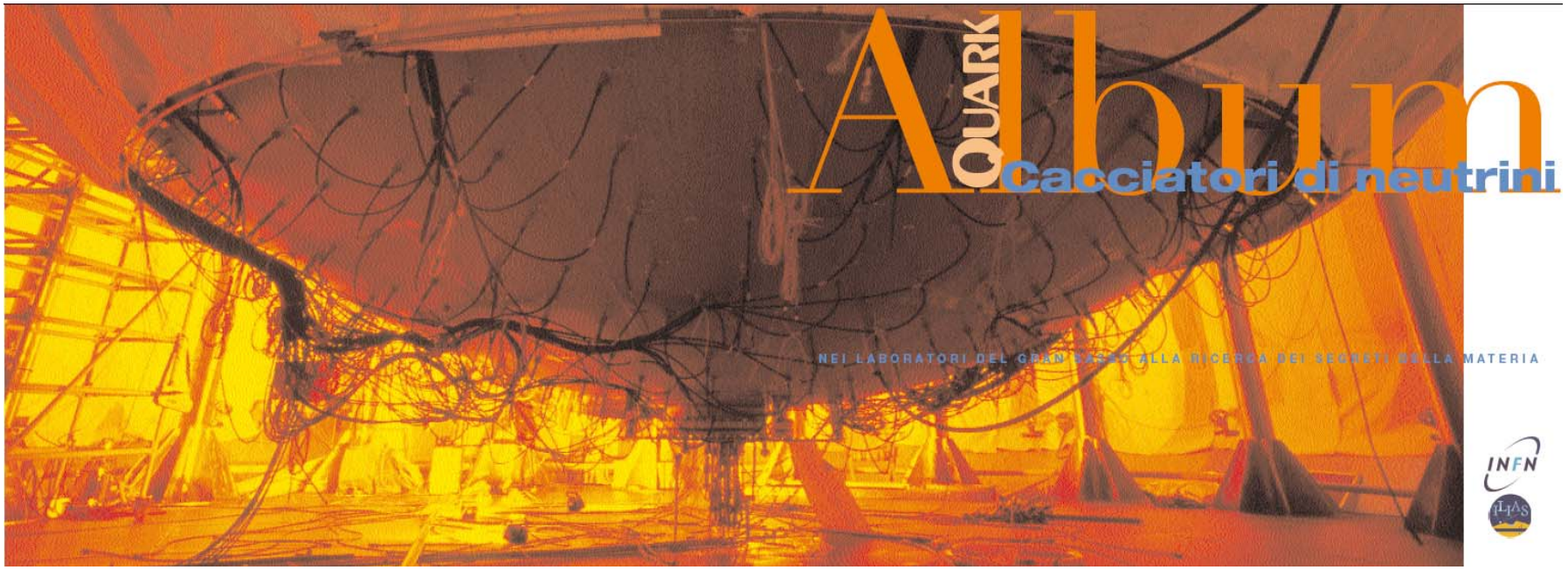
There is a small but continuous production of exhibits for different events. Next ones are: INFN AstroparticlePhysics 2009 exhibition in Roma, Astronomy Museum Infini-TO in Torino and the International Year of Astronomy IYA2009

Build your interferometer

In the frame of a hands-on exhibition taking place yearly in Pisa (Ludoteca Scientifica, April 20 - May 24, 2009), once a week, a Virgo physicist leads a group of high school boys building, with their hands, a small working interferometer.
At the end of the performance the instrument is donated to the students for further studyand experiment.

N2 Communication and outreach activities

The booklet on underground physics in Europe



It has been realized in Italian with the possibility to translate it into other languages.

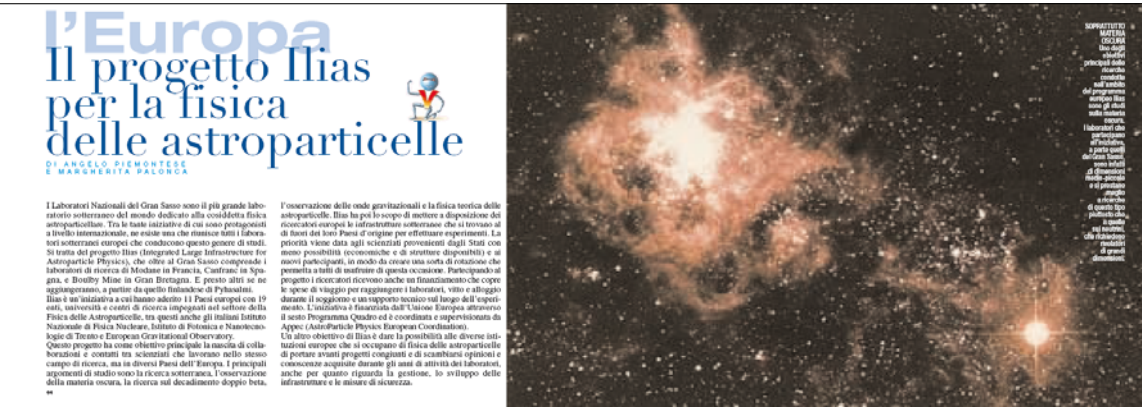
Financed by ILIAS (1/2) and LNGS (1/2)

- 200.000 copies in the news stands (ditributed through an italian magazine)
- 10.000 copies to schools, teachers, politicians, scientists
- Striking layout, many photos and explanatory pictures
- Non technical jargon has been used to reach a wide-ranging public

Main contents:

- introduction to neutrino physics

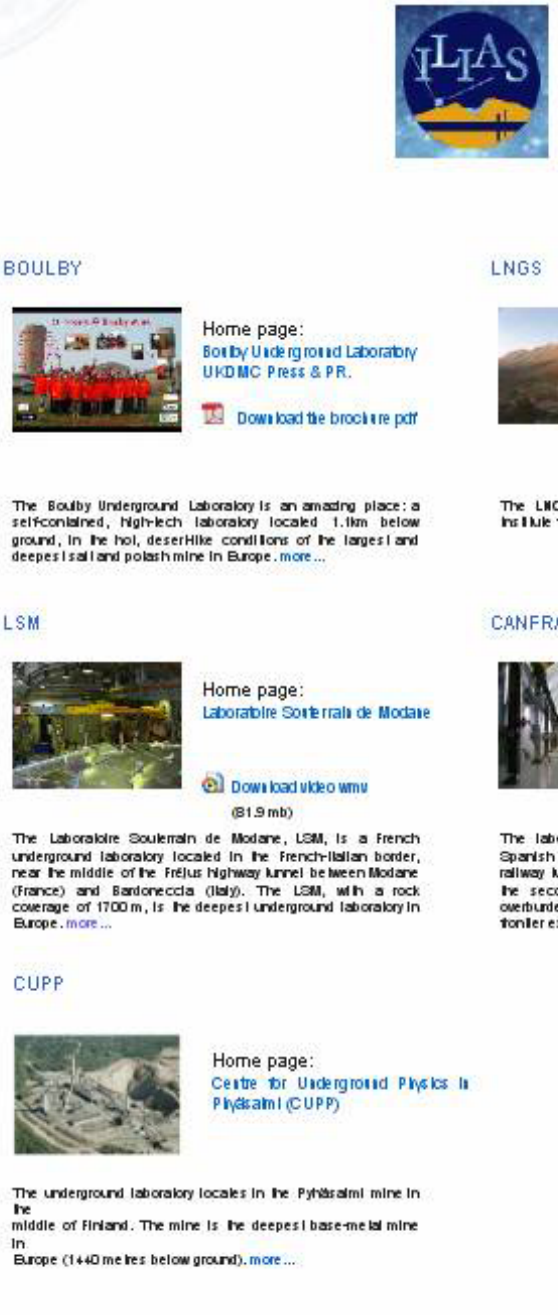
- introduction to the Dark Matter/Energy physics



- description of ILIAS EU program

- detailed description of LNGS and other underground labs activities (LSM, Boulby, LSC and Pyhäsalmi)

Joint web page



www.lngs.infn.it/ILIAS_outreach.htm

- Short description of the labs and their research activities, several pictures, brochures and videos available for download.
- Short summary of the lab outreach activities.
- List of the forthcoming events dedicated to science communication and outreach, like e.g. Open Days

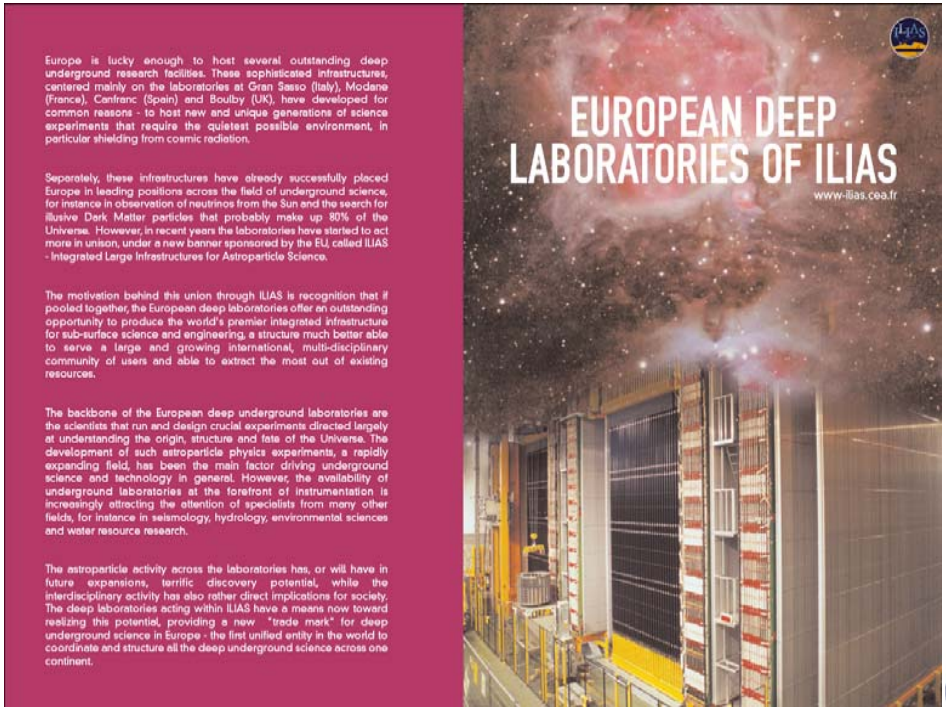
http://pppa.group.shef.ac.uk/boulby/boulby.php
http://www.lngs.infn.it/
http://www-lsm.in2p3.fr/
http://www.lsc-canfranc.es/ (new)
http://cupp.oulu.fi/

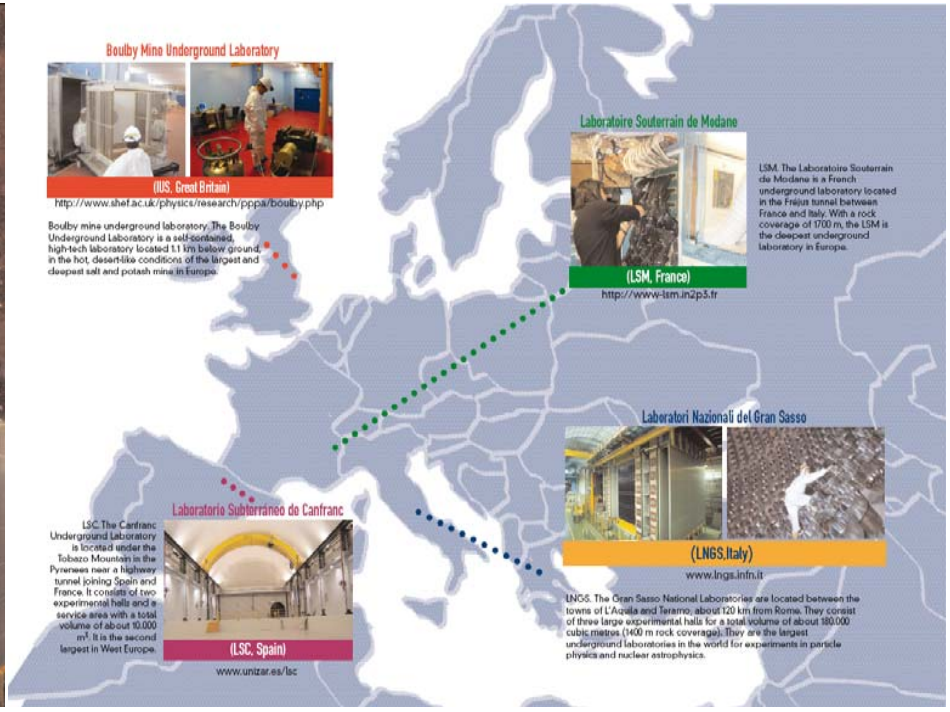
Common Folder on Underground Physics

The common folder has been prepared

Introduction to the European deep laboratories of ILIAS

Description of underground physics





Common Folder on Underground Physics

The folder has been designed to contain general introductive materials about the activities of the underground labs involved in the project: upgraded information can be easily added.

As for example, the brochures already realized by each laboratory, a smaller version of the posters available or presented at conferences, the ILIAS flyer…

LNGS

Italian, English

LSC

Spanish, Italian

LSM

French, English

BOULBY

English

The film on *Underground Physics* in EU

The main goal of the movie is to show the different labs and present some of their experiments. The aim is to show people the research in the EU underground facilities, and its importance not only for physics but also for society.

It is worth to point out that the movie will be distributed on the various national main television networks.

The movie will also be useful for the outreach activities of each laboratory (visits, open day, collaboration with schools...)

A 15 minutes trailer will be available in three weeks… Longer time for the final edition

Web-cams links and Web-casts

The idea:

Underground labs have the capabilities to connect themselves, during particular occasions or public events (i.e. LNGS OPEN DAY), with the rest of the world through web-cams/casts.

- Exploit the camera used to "have a look" over the detectors installed in each labs.
- Use of the web-cams installed for safety reasons.

Privacy policy of few national governments "disrupt" these possibilities

At the moment Boulby and Modane are operative (with constraints…)

3D-Tour around the labs…

LSM: http://www-lsm.in2p3.fr/communication/visite_virtuelle/index.html

Conclusions

•The ILIAS activities satisfied the increasing interest for scientific topics by the public. It is worth to point out the success of the activities finalized to diffuse the scientific knowledge .

• All the tasks foreseen in the project have been realized

•The underground laboratories shared their own experience on outreach and communication activities, with a very fruitful and effective collaboration

•Several didactic tools to show the "invisible" world have been developed by using "professional" experimental devices adopted in particle physics

•**We hope to continue our collaboration in the next future…**

Let me thank all the people that contribute to this talk: LNGS group, J. M. Carmona, Sean Paling, Rachid Lemrani, Pia Loaiza, Gilles Gerbier, Michele Punturo…

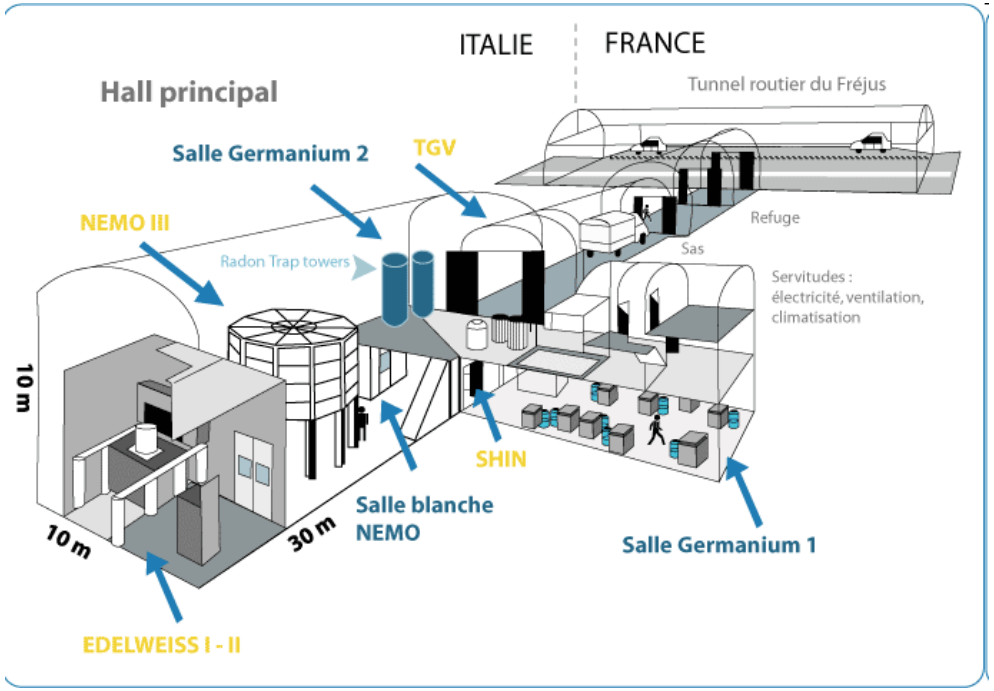
Dedicated to Nicola Ferrari, who gave a fundamental contribution to the ILIAS project…

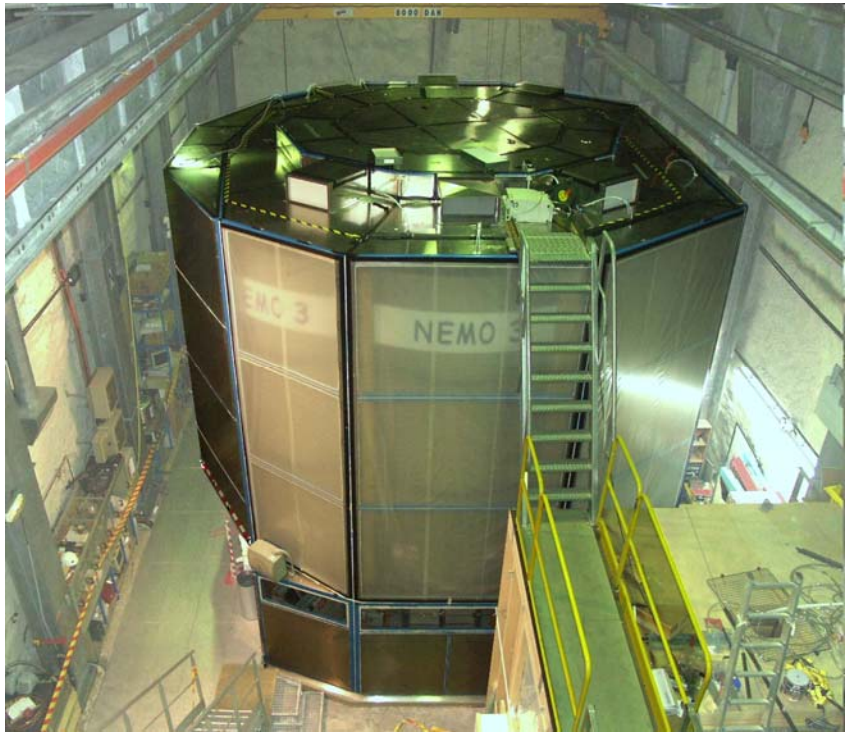
Backup

Modane Underground Laboratory

Research activities

- Dark matter searches
- Neutrino nature (Majorana vs. Dirac)
- Low activity measurements





- Opening: 1982
- 1700 m of rock coverage
- Neutron flux = 5.6 x 10^{-2} s^{-1} m^{-2} (work in progr.)
- Muon flux = 4.7 x 10^{-5} s^{-1} m^{-2}
- Experimental area = about 400 m^2
- Access: horizontal through the Fréjus roadway tunnel.

Modane Underground Laboratory

LSM participated in *Fêtes de la Science 2008*, where the companies and laboratories in the region show their activities.

LSM Visits

Stand in the *Village des Sciences Maurienne*

• Under preparation an interactive exhibition in the new LSM building; the opening is foreseen in June 2009

• Regular visits to the lab (100 visitors during *Fêtes de la Science*, 280 in the year)

• outreach talks (« the Big-Bang and some researches on our Universe », « Recherche et profondeurs », « Recherche and Developpement in the Maurienne Valley », ...)

LSM outreach : 2008

TV programs: (last year)

• *20000 lieues sous les Alpes* France 3, March 2008
*(*6 minutes in the regional news)

• *Oasis du Savoir* Showed on an outreach program in the Arab television, Dec. 2007

Press in 2008 :

• *L'éternité, c'est ici,* Le Dauphiné Libéré , August 13th, 2008

• *Un trésor enfoui,* Le Dauphiné Libéré , August 6th, 2008

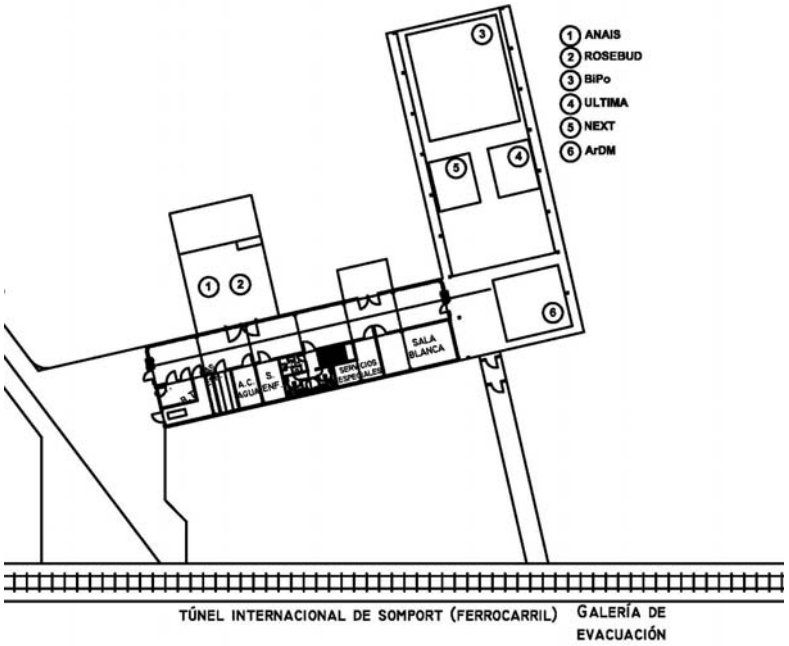
Participation in the ILIAS film

The Canfranc Underground Laboratory

Due to maintenance works, LSC will be operative in a few months.

Research program

- Dark matter searches
- Neutrino nature (Majorana vs. Dirac) and mass
- Nuclear astrophysics
- Physics of system near absolute zero
- Extreme low background techniques
- Sub-surface geo-dynamics
- Environmental ultra-low background studies
- Life under extreme conditions

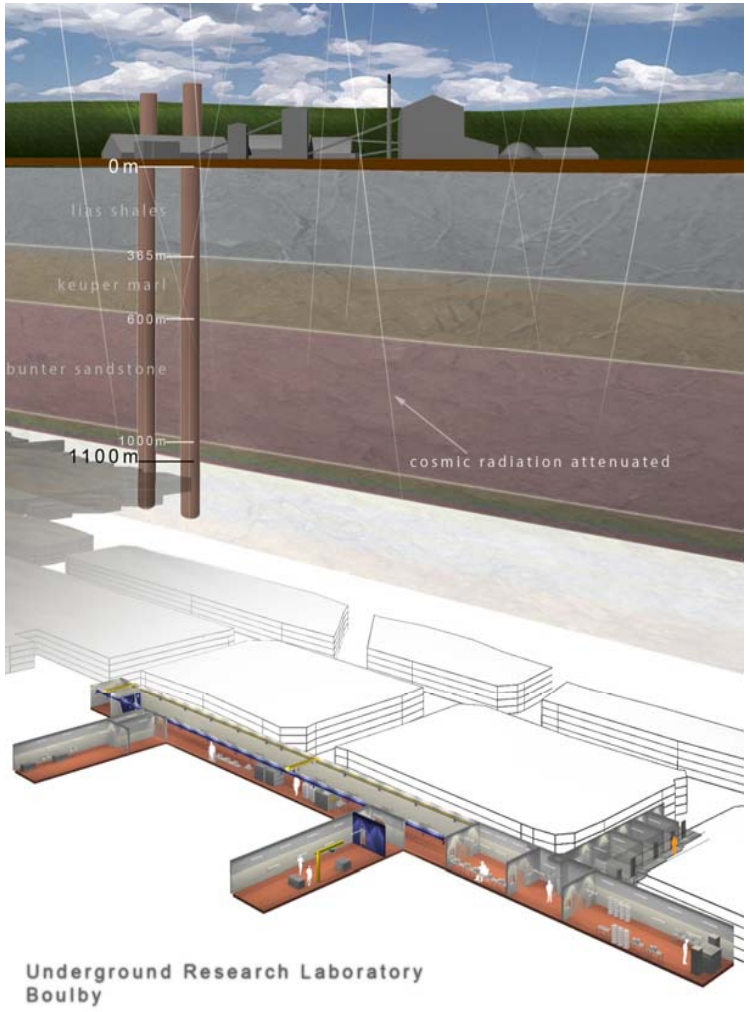


- Opening: 1986 old lab, 1995 extension, 2006 new
- 850 m of maximum rock coverage
- Neutron flux = 2.0×10^{-2} s^{-1} m^{-2}
- Muon flux = $2.0 \div 4.0 \times 10^{-4}$ s^{-1} m^{-2}
- Experimental area = about 1000 m^2
- Access: horizontal through two tunnels (freeway and safety)

Boulby Underground Laboratory/IUS

Research activities:

- Astrophysics (DM underway through **ZEPLIN-II, ZEPLIN-III, DRIFT-II**)
- Low Background studies
- Geology and Geophysics



- Opening: 1993 old mine – 2001 new mine
- 1100 m below ground in Boulby Mine
- Scientific users = 30
- Neutron flux above 0.5 MeV = 1.7×10^{-2} s^{-1} m^{-2}
- Muon flux = 4.5×10^{-4} s^{-1} m^{-2}
- Experimental area = about 1500 m^2
- Access: Vertical through shaft of working potash mine

Boulby Underground Laboratory – media coverage

Engaging media interest in the last year - partially connected to the start of the LHC at CERN. Recent national/international coverage included the Economist's 'what to look out for in 2009' and dedicated articles in the Wall St Journal and Observer.

Selected Press:

The Economist's 'the world in2009'.Dec2008.
Wall st Journal Article. Nov 2008.
The Observer Sept 08

Radio:

Radio4 (PM programme) and World service piece - Jan 2009
Radio 5 live, Simon Mayo show, Wed 10th
Radio Tees, Katherine Hannah show, Wed 10th (about 1 hour in apparently)
Radio York. Reynolds & Co, Wed 10th, (about 7:30am)

BUS2009 workshop:

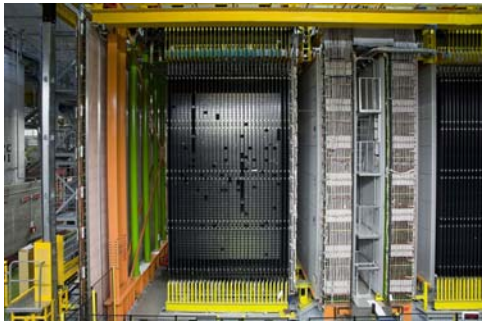
Plans are underway for the second Boulby Underground Science workshop (BUS2009) to be held in September. The workshop will showcase all of the science underway and planned at Boulby and be open to contributing and interested scientists as well as local interest groups and individuals. Invitation for the workshop will be spread out in the coming month.

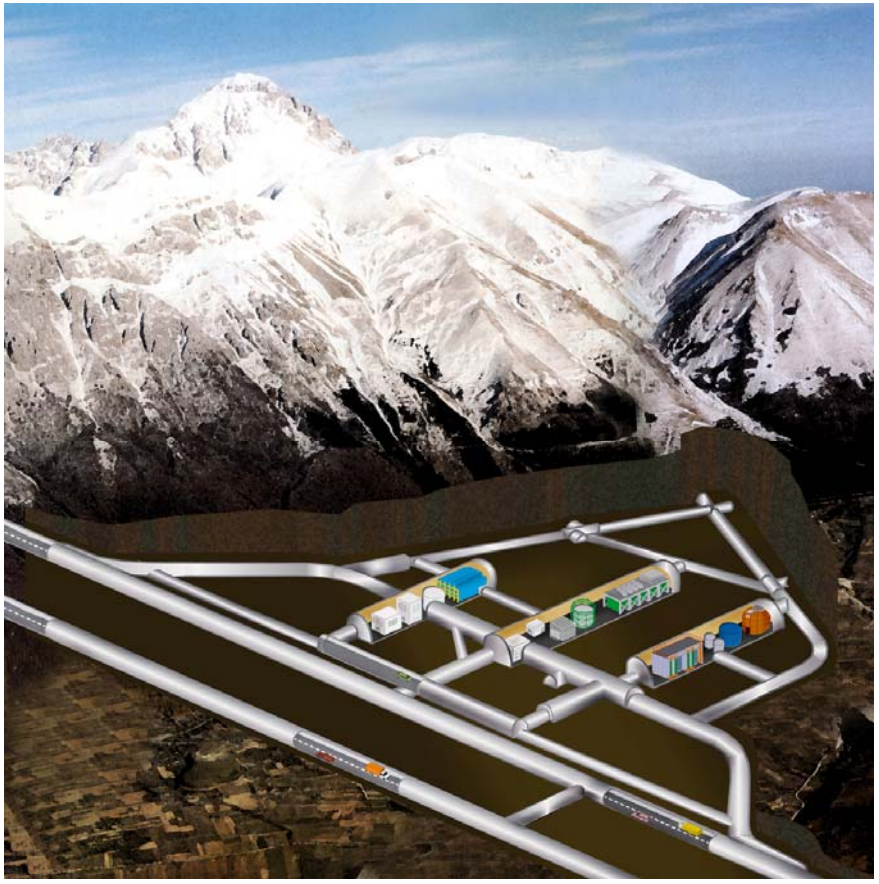
Gran Sasso National Laboratory

Laboratori Nazionali del Gran Sasso

Research activities

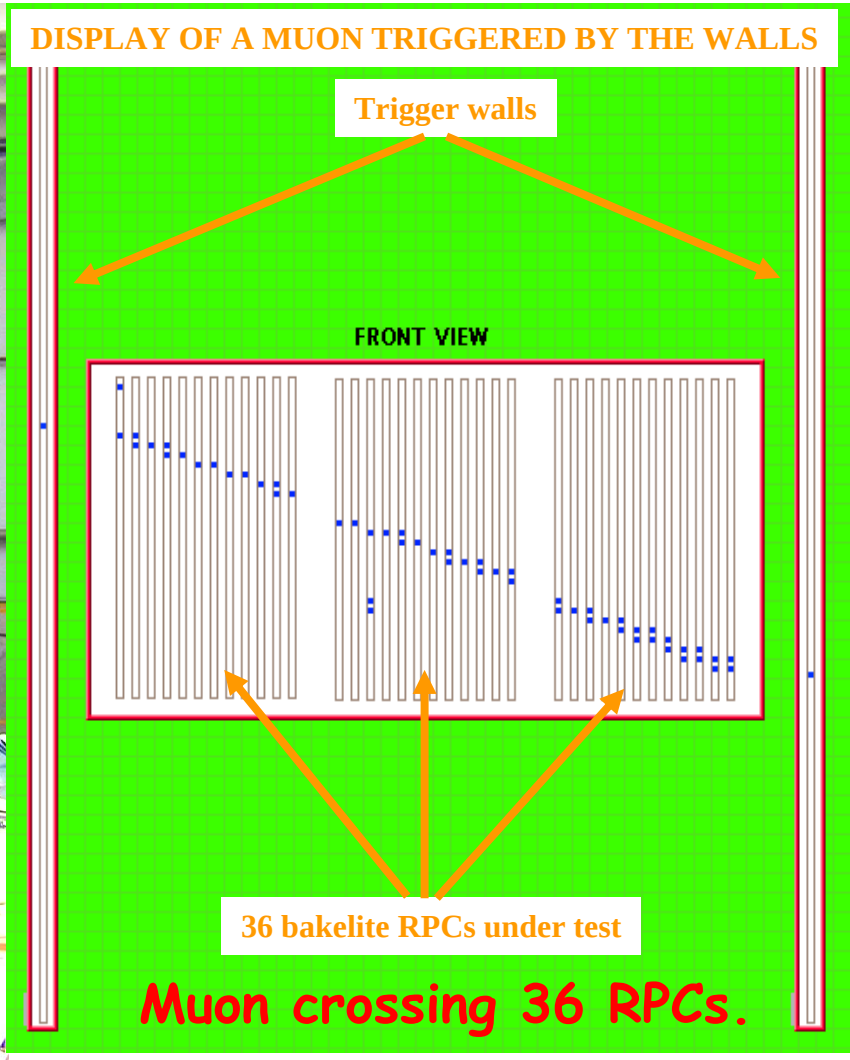
- Neutrino physics (OPERA, BOREXINO, ICARUS, LVD, GERDA, CUORE,COBRA)
- Dark matter (DAMA/LIBRA, WARP, XENON, CRESST)
- Nuclear reactions of astrophysics interest (LUNA)
- Fundamental Physics (VIP)
- Geophysics (ERMES, GIGS, TELLUS)
- Biology (PULEX2, CRIORAD)





- Opening: 1987
- 1400 m rock coverage
- Scientific users = 752 from 26 countries
- Muon flux = 3.0×10^{-4} s^{-1} m^{-2}
- Experimental Area = 3 halls for about 17300 m^2
- Access: horizontal through the express way tunnel

Experimental technique used in outreach activities: OPERA TEST FACILITY



This facility is a very impressive way to show the "invisible" world of particles...