



LRT2010 at SNOLAB
Topical Workshop in Low Radioactivity Techniques
(Sudbury, Canada)
August 28-29, 2010

Bulletin 1 - May 2010

1. Motivation

This workshop examines topics in low radioactivity materials and techniques, which is probably the most fundamental part of rare event physics detectors, such as for solar neutrinos, dark matter, double-beta decay, and long half-life phenomena.

The entire field of deep underground and rare event physics is becoming a dominant area of global research, with dark matter seemingly on the cusp of detection, the neutrino mass within the range of double beta decay experiments, and precision solar neutrino measurements becoming possible. More than ever, the next generation of rare event detectors are needing advanced materials and techniques in low radioactivity.

Meanwhile, around the world countries are investing in new and expanded underground facilities, and new experiments are being funded and constructed. In Canada, SNOLAB is finishing the outfitting of the newly excavated underground labs at the site of the Sudbury Neutrino Observatory. The first suite of experiments are under construction, with prototypes already collecting data, and most large experiments will be coming online in the period 2011-2013.

In the United States the NSF has selected Homestake for the Deep Underground Science and Engineering Laboratory (DUSEL), and the detailed design is in progress. Meanwhile the Sanford lab at Homestake is operational, the main Davis campus is currently being excavated, and the deep mine dewatering and shaft rehabilitation is progressing well. Several dark matter experiments have recently released results of high sensitivity search for dark matter pushing the limits down to 10^{-8} pb, including the CDMS experiment at the Soudan underground lab, Edelweiss at Modane, Xenon100 at Gran Sasso, and ZEPLIN-III at Boulby.

In Europe Gran Sasso has completed the public works upgrade, and is in a renewal phase for experiments, with various new experiments planned, in construction, and running.

The Canfranc lab in Spain has been rehabilitated and expanded to include two new halls. The Modane lab in France (LSM) is expected to be expanded to twenty times the current volume during the Frejus second tunnel construction, with the EURECA dark matter experiment and the SuperNEMO double-beta decay experiment being prime candidates for running in the new lab.

In Asia the large facility at Kamioka has expanded again with new halls which will accommodate XMASS and CANDLES experiments, and the KamLAND detector is preparing for the double beta decay phase of the experiment. The new Chinese CJPL lab is under construction with a low background facility and the first phase of CDEX to be ready in 2012. Meanwhile Korea is expanding the Yangyang underground lab with a new hall for the TEXONO detector.

Recent experimental proof of neutrino mass and flavour oscillations continues to enrich and expand the field of neutrino astrophysics. The next steps in neutrino research seek to fix the absolute mass scale, measure the mixing parameters and CP-violation, determine if neutrinos are Majorana or Dirac particles, and to measure the flux of lower energy neutrinos from the primary reaction processes in the sun. The field also includes detectors for dark matter searches, and the detection of geo-neutrinos, reactor neutrinos and from possible beamed neutrino sources.

These facilities, detectors and experiments all require ultra-low detector backgrounds to reach the instrument sensitivities required. This demands novel techniques in the development, construction, operation and analysis of these experiments. Such issues include the low background radioactivity assay and purification of detector components and materials, and the development of high purity noble gases.

The goal of this workshop series is to bring together experts in this field for presentations and discussion covering broadly the issues of low radioactivity techniques. The intention is to foster and continue the collaboration and resource sharing required for the new generation of detectors to be developed at underground facilities. Common tasks and shared resources may include: 1) Coordinated use of HPGe gamma-ray spectrometers, other gamma-ray and neutron detectors by different groups/collaborations; 2) Databases of material purity; 3) Joint purchasing of radio-pure materials; 4) Monte Carlo simulation tools; 5) Radon emanation measurements; 6) Purification processes etc.

The last (and second) LRT workshop was in 2006 at Aussois, France hosted by Modane underground lab, and the first LRT workshop was hosted at Laurentian University in Sudbury in 2004. It is intended that the workshop be held approximately every 2-3 years. However, due to such things as construction at SNOLAB, the DUSEL process, L'Aquila earthquake, Canfranc development etc, the underground labs were not quite ready for another workshop. Anyway, we now feel overdue to hold this workshop again. The major underground labs around the world are now planning and constructing experiments, and are strongly in need of the LRT principles examined in this workshop series.

2. General Information

The workshop will be hosted at the SNOLAB site in Lively (near Sudbury), Canada, Saturday and Sunday 28th-29th August. Tours of the underground labs will be arranged for the Friday before and the Monday following the workshop, so if possible participants should plan to include at least one of these days. Note that participants should arrive on Thursday August 26th in order to take the underground tour on Friday, as the trip underground starts early in the morning. A banquet dinner is planned for Saturday evening.

Due to the short lead time for this workshop, please send a short email to lrt2010@snolab.ca at your earliest convenience to express your interest in participating. Up to date conference information and registration will be available soon on the website <http://www.snolab.ca/lrt2010>.

3. Format and organisation

The format will be topical sessions with a program of invited and contributed talks. The program will leave time for some questions and discussion after each talk, with extra discussion time at the conclusion of each session. The workshop format is intended to provide for an active discussion in these periods among all participants.

Posters are also invited and will be posted directly in the conference hall for break time and inter-session discussions.

Contacts for the workshop and local organisers are listed at the end of this bulletin. An international advisory committee is being formed to set the workshop program.

4. Workshop topics, invited talks, and proceedings

This conference is intended to be wide in scope to include all aspects of the development of low background detectors and techniques. Topics include, but are not limited to:

- Survey of existing and planned low background facilities and resources.
- Low background detectors, shielding techniques and radiopurity requirements.
- New scintillators (optical properties, loading, and purification).
- Radon emanation and diffusion studies.
- Radon assay techniques.
- Radon free air, very low background noble gases (free of Rn, Ar and Kr).
- Radium assay techniques.
- Wash-off, leaching, surface contamination, screening and cleanliness studies.
- Water and scintillator purification studies.
- Low-level gamma-ray spectrometry.
- Neutron activation analysis techniques.

- ICPMS, atomic absorption and x-ray fluorescence spectroscopy.
- Studies of cosmogenic activation of materials.
- Software, simulations, electronics, vetoes and in-situ assay techniques.
- Simulation of background radiation and cosmic ray backgrounds and neutron fluxes.
- Adaptation of industrial processes and instrumentation.

An agenda of invited talks will be posted on the conference website when it is available. Participants interested in presenting at the workshop are encouraged to send an abstract to the scientific advisory committee.

Invited talks will be published in the proceedings; a copy is included in the registration fee for all participants. Presentations, transparencies, submitted posters and other contributions will be posted on the conference website.

5. Registration and information

Participants can register for the workshop on the website <http://www.snolab.ca/lrt2010> which will be available soon. Program times and details, and all other updated information will be available on the website.

Participants should indicate their interest in the underground tour of SNOLAB at registration time. The tour will be arranged on the basis of this information and details announced at the workshop.

6. Workshop location, travel and accommodation

The workshop will be held at the SNOLAB surface building in the main auditorium, with other meeting rooms also available. The SNOLAB building is located next to the Vale Inco Creighton Mine #9 shaft headframe, which is just outside the town of Lively, Ontario (near Sudbury). Refreshments and buffet lunches will be available on location; these and a banquet on Saturday evening are included in the registration fee. Other meals can be arranged by participants at hotels and local restaurants. Maps and suggested restaurants will be posted on the website and made available at the workshop.

Travel to Sudbury, Canada, is arranged by the participants. Sudbury has a local airport, where rental cars or taxis are available for transport to hotels. Travelers may also choose to rent a car from Toronto airport and drive approximately 4 hours to Sudbury. Maps and detailed travel advice will be available on the website. People travelling into Sudbury by air should book early, as the small planes into Sudbury airport will fill quickly.

Accommodation is available at several nearby hotels; details will be listed on the website with arranged rates and contact information.

A minibus will provide transport from the arranged hotels to the conference according to a schedule to be posted on the website and announced at the workshop. Since there is a minibus, participants staying at the arranged hotels would be better to get a taxi from the airport. Also, since it is a small airport, participants will likely find themselves on the same flights, and can group share the taxi cabs. Parking is available at the SNOLAB building at Creighton Mine.

There is no program or registration for accompanying persons. However, there is a lot to do and see in the city and surrounding area for accompanying persons, including a science centre, a mining technology centre with underground tours, museums, art galleries and shops, lakeside walks within the city, fine restaurants, sports facilities, etc. It is suggested that accompanying persons have access to a rental car to best see these attractions.

7. Important dates

Those planning to attend are requested to immediately indicate their interest in participating in this workshop by emailing lrt2010@snolab.ca. Participants should also register for the conference on the website at their earliest convenience.

Participants interested in presenting a talk should submit an abstract to the advisory committee (by email to lrt2010@snolab.ca). Abstracts should be submitted by July 15th 2010.

8. Contact information, organising committees and sponsors

All registration and information matters are directed to the workshop website at <http://www.snolab.ca/lrt2010>. Email should be sent to lrt2010@snolab.ca.

Conference organising committee:

Richard Ford (committee chair) ford@snolab.ca

Pat Brouse (workshop secretary)

Fraser Duncan

Doug Hallman

Chris Jillings

Samantha Kuula

Christine Kraus

Ian Lawson

Nigel Smith (SNOLAB director)

International science advisory committee:

Mark Chen (Queen's U.)

Prisca Cushman (U. Minnesota)

Steve Elliot (Los Alamos)
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Aldo Ianni (INFN Gran Sasso)
Vitaly Kudryavtsev (U. Sheffield)
Pia Loaiza (LSM CNRS/CEA)
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Lino Miramonti (U. Milano)
Masayuki Nakahata (ICRR U. Tokyo)
Tony Noble (Queen's U.)
Andreas Piepke (U. Alabama)
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The workshop secretary, Pat Brouse can be contacted at:
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The workshop is sponsored in part by:
SNOLAB (<http://www.snolab.ca>)