HOMESTAKE DUSEL AND SANFORD LABORATORY NEWSLETTER

Dear Homestake Collaboration,

Welcome to the September monthly newsletter for Homestake DUSEL and South Dakota's Sanford Laboratory. We are always glad to receive your input on news, links to news articles, upcoming workshops, conference notices, scientific updates, information concerning the Collaboration, and other highlights relevant to our shared goal.

Important Dates

October 1-3: DUSEL ISE Workshop – Lead

October 4-6: LBNE Collaboration Meeting - Lead

National Science Board Announcement

At their September 24 meeting, The Board authorized the NSF Director, at his discretion, to make an award for the Preliminary Design for the Deep Underground Science and Engineering Laboratory (DUSEL), University of California at Berkeley.

More details in the October issue!

DUSEL Preliminary Design

The DUSEL Engineering group has modified the preliminary design of the 4850 level to reflect the developmental baseline for the Preliminary Design Report. Figure 1 shows the current plan view of the 4850 level at the first phase of construction. The first lab module will be designed to accommodate a particle accelerator for nuclear astrophysics experiments and is expected to be smaller than the standard 20 x 20 meter lab modules. Lab modules 2 and 3 are standard 20 x 20 x 100 meters long with lab module 3 rotated to a different orientation bringing it in line with FNAL for the Long Baseline Neutrino Experiment (LBNE). The large cavity has been relocated closer to the existing infrastructure with a parallel bypass drift used for excavating the large cavities and enlarged to house future equipment for the LBNE. The new winze has also been relocated to the large cavity bypass drift.

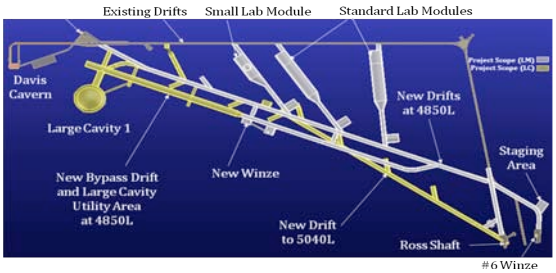


Figure 1: 4850L – Plan View, Developmental Baseline for the Preliminary Design Report

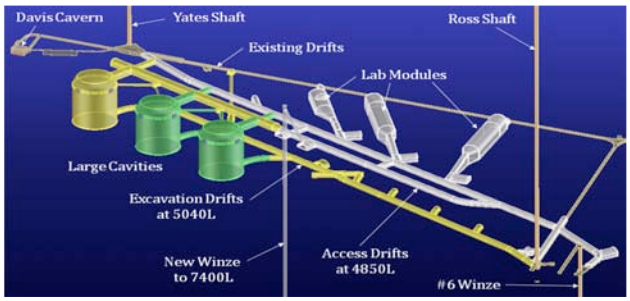


Figure 2: 4850L Developmental Baseline for the Preliminary Design Report with the addition of two more large cavities and a new winze to the 7400L.

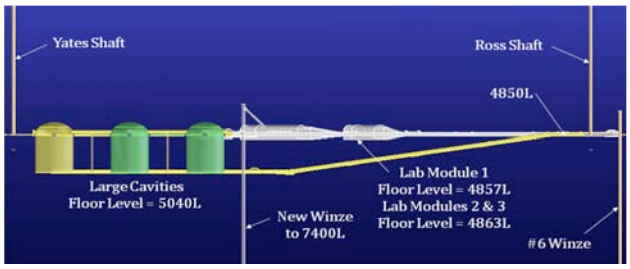


Figure 3: 4850L Elevation View, Developmental Baseline for the Preliminary Design Report

Geotechnical Site Investigation

As of September 15, Dr. Zbigniew Hladysz reports, the first five drill holes were completed. The measured drill hole deviations were within the acceptable range of 1 – 2 degrees. The geotechnical logging is done while the core is still in the split core barrel to maintain core integrity and data quality. Once the primary logging is completed, the core is placed in boxes and transported to the surface for further analysis and interpretation (Fig. 4). The core nominal diameter is 61 mm.

Figure 4: Oriented core in boxes

Recovery has been excellent. Very little water has been encountered. So far, the rock is good enough to proceed with the potential location for the Large Cavity #1 as planned. Drilling operation will recommence October 1, 2009.

Figure 5: Golder crew-Wayne Mulder (middle) and Christopher Phillips (right)-of Mississauga, Ontario, Canada insert Televiewer column into drill hole

During the period of the next two weeks all drill holes except Hole #1 (grouted due to the nearby drifting activity) will be used for borehole imaging and rock structure logging using an optical televiewer. Televiewer measurements are already in a very advanced phase (Fig. 5). Concurrently, the in-situ stress measurements are being conducted in two areas, near the drill stations (Figs. 6 and 7).

Figure 6: Drilling/overcoring of the instrument (Golder crew from UK)

Figure 7: The instrument: Hollow Inclusion Cell with 4 three-element stain rosettes

Internal Review: August 31- September 2, 2009

Nearly fifty people converged at Sanford Lab in Lead, South Dakota for the DUSEL Internal Review on August 31–September 2. Fifteen reviewers from Fermilab, LBNL, South Dakota School of Mines & Technology, and other institutions viewed presentations by DUSEL participants from UC Berkeley and South Dakota. UC Berkeley's Vice Chancellor for Research, Dr. Graham Fleming visited with Diane Leite, Deputy Director of Berkeley's QB3 program. Dr. James Symons, Nuclear Science Division Director-LBNL, and NSF representatives were in attendance.

Figure 8: Diane Leite, Deputy Director of UC Berkeley's QB3 Program, investigates underground site

On the first day, Drs. Kevin Lesko, Bill Roggenthen and others presented overviews of different aspects of the DUSEL project. After receiving safety training, DUSEL reviewers took an underground tour with tour guides and escorts. The next day, the various groups met in breakout sessions to discuss issues of surface and underground facilities, Project Management and Cost Systems, Environmental Health and Safety issues, Education and Outreach facilities, and the Integrated Suite of Experiments.

On the final day, reviewers met in executive session before presenting a draft summary report on their assessment and findings. Reviewers were

impressed with DUSEL's progress. The report is still being finalized and further information will be presented in future.

Figure 9: Sydney De Vries (P.Eng.), Underground Construction Project Manager, (front, right) was one of the underground tour guides for DUSEL Reviewers

Updates

Progress continues on development of the Integrated Safety Management System (ISMS) in defining the interface, incorporation, and congruency of DUSEL EH&S policy and SDSTA implementation. Preparations for coordinated joint safety walkthroughs by DUSEL and SDSTA are nearly complete and will include participation by experts from multiple national labs having a mature ISM system.

Surface assessment is complete. HDR CUH2A provided a proposal for the preliminary design of the surface infrastructure.

Basis of Estimate work by ARUP continues building on initial interim draft report. Ventilation analysis continues as well as underground site investigation. Estimated level of completion of scope elements are on schedule.

SANFORD UNDERGROUND LABORATORY AT HOMESTAKE

Dewatering

The water level at the Sanford Lab at Homestake is just above the 5,000-foot level -- at about the same level since late July -- but by mid-September electrical upgrades and pipe replacements were complete and the water system had been ramped up to pre-upgrade pumping rates. The water level has begun to drop again.

South Dakota Science and Technology Authority technicians continued with preparations on the 4,850-level for the deep-water pumping system that will dewater Homestake. Old electrical cables and other infrastructure had been removed around Six Winze, the shaft that accesses the lowest level of Homestake.

On the surface, a new set of sand filters was onsite and ready for installation over the next month or so. The new sand filters will remove iron from the underground water faster and cheaper, using smaller amounts of chemicals.

Figure 10: Sanford Lab Infrastructure Technician Luke Scott surveys the empty Davis Cavern on the 4850 Level. Scott and his colleagues removed tons of steel from the cavern this summer, including the 110,000-gallon tank that was part of the neutrino detector designed by Ray Davis.

Davis Cavern empty, excavation begins

Sanford Lab infrastructure technicians had removed all the steel from the Davis Cavern by mid-September, and excavations were about to begin to enlarge the cavern for the LUX dark-matter experiment. In preparation for excavations for LUX and for the Majorana experiment, three large "LHD" (Load-Haul-Dump) loaders have been assembled on the 4,850-foot level, along with a single-boom electric-hydraulic "jumbo" drill. Drilling and blasting began September 23.

Figure 11: Sanford Lab Underground Operations Foreman Jack Stratton behind the 20-foot boom of the Jumbo drill on the 4850 Level

The LHD pictured below has a large 2½-yard bucket. The other two LHDs have 1¼-yard buckets. These are stationed at the rock face near the Davis Cavern. One of the smaller buckets will move rock over at 17 Ledge for disposal down a raise.

Engineering Project Engineer Willy McElroy provided an interesting fact that the LHD (below) purchased from MTI, came from the Sunshine Mine in Idaho. Dr. Ray Davis originally planned to install his neutrino detector there. The Sunshine Mine was the site of a devastating fire in 1972, so it is fortunate that the neutrino detector was located elsewhere.

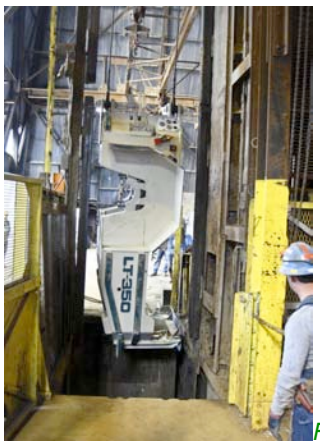


Figure 12: LHD arrives at 4850 Level below the Ross Shaft cage

Ventilation infrastructure

Technicians were preparing for remote camera inspections of the Oro Hondo and No. 5 ventilation shafts in anticipation of upgrades.

Yates Shaft re-entry

A contractor has inspected the Yates Shaft down to the 4100 Level, allowing another emergency egress from the 4850 Level. (A system of ramps connects the 4850 Level to the 4100 Level.)

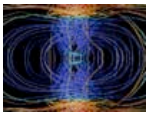
LUX on board

Texas A&M graduate student Ty Stiegler set up shop in Lead to do advance work for the LUX collaboration. The LUX Surface Facility, which will be in a refurbished Homestake warehouse, will be ready for occupancy by mid-October.


Figure 13: Josh Rouns of MTI assembles the LHD at the 4850 Level Crossover. Please note Mercedes engine logo.

EDUCATION AND OUTREACH PLANNING

Congratulations to the firm of Oppenheim Lewis Inc. for having been selected to provide "Project Management for the Development of Programs, Exhibits, and Operations for the Sanford Center for Science Education." This work will complement and inform the preliminary design of the education facility. Their team brings extensive experience and expertise in the development of science centers, museums, and cultural institutions. Additional requests for proposals are anticipated in the near future to conduct a market analysis for the education center, to help develop the center's business plan, and for creative design of exhibit spaces and educational programs.



Supernova Physics & DUSEL Workshop

Drs. David B. Cline (UCLA) and George Fuller (UCSD) organized the workshop, "Supernova Physics and DUSEL," at UCLA September 16-17.

According to Dr. Cline, about 25 experts on Supernova Dynamics Supernova Neutrino Emission and Detectors to measure neutrinos at DUSEL came together at this workshop. The first day of the workshop focused on the latest theoretical study of Supernova Dynamics. New ideas have emerged from this field, including the concept that Neutrino

energy swamps due to the intense neutrino scattering in the Supernova and the fact that neutrinos can transform into each other by "Neutrino Mixing." This has important consequences related to the design of detectors at DUSEL.

On the second day, attendees primarily focused on possible detectors at DUSEL and the hope and future promise of detection of the Relic Neutrino flux from all past Supernova explosions. In order to fully exploit the physics from the Supernova neutrinos, both electron neutrinos and anti-neutrinos need to be detected. This can be done using a large Liquid Argon TPC (20 KT or more) and a Water Cherenkov detector (a few hundred kilotons). Fortunately, both are being studied for DUSEL and there were several excellent talks on both at the meeting. The future of Relic Neutrino detection could also use both detectors so that a comparison can be made of the two spectra.

Another development is the possibility to detect Supernovas in large Dark Matter detectors. It is believed that the bulk of the elements such as oxygen and carbon (essential to life) are created in such explosions. Also, we could learn of the process of the Supernova explosion and possibly a great deal about the fundamentals of neutrinos. In 1987, a Supernova was detected with just 19 Neutrino events and we have learned much from this event. The prospect of 10-20,000 neutrinos and anti-neutrino events in different DUSEL detectors is extremely exciting!

A white paper is being prepared with additional details and will be available soon.

ENVIRONMENT, HEALTH & SAFETY

Back to School Safety

Check playgrounds for safety: experts recommend at least 9 inches of shock-absorbing material underneath playground equipment.

Wear a bike helmet that meets safety standards.

Remove or tie up hoodie drawstrings.

Eat healthy after-school snacks.

JOBS

DUSEL is seeking an Education & Outreach Director. For more info, please refer to the ad: https://yourfuture.sdbor.edu/applicants/jsp/shared/frameset/Frameset.jsp?time=124810512964

Fall Workshop on DUSEL Science and Development of the MREFC

30 September - October 3: This workshop will provide a forum to discuss experiments proposed for DUSEL and to begin the task of coordinating the experimental program for the MREFC application. The meeting is open to all scientists interested in proposing underground experiments at DUSEL. In particular, the goals of the meeting are:

1. Foster and develop experimental programs at DUSEL.
2. Hear status updates from agencies, the facility, and from large cavern activities.
3. Understand the timeframe needed for deliverables for the MREFC.
4. Meeting opportunities for S4 awardees and other scientists not previously involved with DUSEL.
5. Search for commonalities that may influence the infrastructure design of DUSEL.
6. Allow proponents of experiments the opportunity to meet responsible staff and discuss requirements for their experiment.
7. Explore E&O interactions.
8. Explore locations for specific experiments utilizing the Vulcan database and go underground to site these experiments and to inspect the facility.
9. Interact with facility to further relationships between facility design team and experimental collaborations.

This meeting is particularly timely because the schedule to the MREFC is aggressive, requiring that preliminary designs of experiments are available by Summer 2010. Desired outcomes from this workshop include:

1. Selected experiment locations
2. Facility needs
3. Schedules for occupancy and for deliverables
4. Major outstanding R&D needs
5. Points of Contact: Spokesperson and Engineer

Contacts: Daniela Leitner and Tullis Onstott, DLeitner@lbl.gov, tullis@Princeton.EDU, or visit: http://www.lbl.gov/nsd/homestake/workshops/fallworkshop09/index.html

Special Session on Underground Science at the Fall Meeting of the American Geophysical Union

Please note a special session at the Fall AGU meeting for researchers working at underground labs, including DUSEL. Meeting date: December 14-18, 2009. Location: San Francisco. For more info: http://www.agu.org/meetings/fm09/

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