



Assaying critical to LZ success



Left: Photomultiplier tubes are placed into a low-background counter. Right: PMTs sit near a germanium crystal surrounded by copper and lead shielding.

Although it won't be operational for another three years, the LZ (LUX-ZEPLIN) dark matter experiment is keeping collaboration members very busy. They've decommissioned LUX (Large Underground Xenon Experiment), received CD-3 approval, and begun assaying materials that will be used in the detector.

The collaboration hopes to detect WIMPs, or weakly interacting massive particles, the leading contender for dark matter particles. LZ will be 30 times bigger and 100 times more sensitive than LUX and could be the best chance scientists have at discovering dark matter. But for that to happen, every component used to build the detector, including electronics, nuts and bolts, cables and PMTs, must be as radio-pure as possible.

"All materials contain trace radioactive contamination," said Dr. Kevin Lesko, a collaboration member who oversees material assaying for LZ. "We assay them to ensure we don't introduce high backgrounds into the experiment."

Recently, testing began on PMTs in the Black Hills State University Underground Campus (BHUC) low-background counting facility on the 4850 Level of Sanford Lab.

"We're looking for specific radioactive isotopes that could cause problems in the experiment," said Dr. Brianna Mount, a research assistant professor at BHSU and lab

director of the underground campus. "If backgrounds in any PMT are too high, it can't be used."

Altogether, more than 500 PMTs will be installed within the detector and the water tank that holds LZ. PMTs are critical in the search for dark matter because they can detect a single photon of light. So, if a tiny flash of light in the tank corresponds with a signal in the detector, researchers will know it was not caused by dark matter.

Approximately 350 PMTs will be tested at the BHUC. The PMTs are sent from Brown University to Sanford Lab. Each PMT is triple bagged, with the innermost bag filled with ultra clean nitrogen. Upon arrival at the BHUC, the outer two bags are removed and the PMTs, still inside the nitrogen-filled bag, are loaded into a jig, or holder, and positioned near a high-purity germanium crystal for up to two weeks. The data is accessed remotely and analyzed at Brown University and Lawrence Berkeley National Lab (LBNL).

Lesko, an astrophysicist with LBNL, said the project is going very well. "It's a very busy time but we've seen significant progress."

Background testing on the PMTs is expected to be complete within a year.

Deep Talks Thursday 'From LUX to LZ : More than scaling up'

Late last year, LUX was decommissioned to make way for a second-generation dark matter experiment that will be 30 times bigger and 100 times more sensitive. Every aspect of LUX-ZEPLIN (LZ) faces challenges beyond just making things bigger.

At this week's Deep Talks, Dr. Markus Horn, research scientist at Sanford Lab, will discuss the plans to build LZ and the activities at Sanford Lab and other sites to achieve this ambitious goal. Deep Talks "From LUX to LZ" will be held Thursday,

Jan. 12, at the Visitor Center in Lead. The event begins at 5 p.m. with a social; the talks starts at 6 p.m. Deep Talks is co-sponsored by the Sanford Lab Homestake Visitor Center, First Interstate Bank and Crow Peak Brewing Company.