A New Underground Radionuclide Laboratory – RL16

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Impetus for Underground Measurements

Desire for more sensitive lab measurement
- Lower levels, or same levels of sensitivity faster

PNNL has recently constructed a shallow underground facility for low-background radiation experiments
- Depth: 38 meter water equivalent (mwe)
- “Four stories” underground
- Approximately 100x fewer fast neutrons and 6x fewer cosmic ray muons
PNNL Underground Lab Facility
PTS visit to PNNL underground lab April 2011

Executive Director Tibor Tóth dons attire to enter the facility
Underground Facility Capabilities

- Multiple capabilities
  - Copper electroforming
  - Low-background machining
  - Detector assembly clean room
    - Class 10k & 1k
  - Low-background measurement hall
    - Includes RL-16 upgrade
Featured Enhancements

➤ Low-background shield
  - very low in primordial radioactivity like U, Th, K
  - 20 cm Pb, 10 cm Cu

➤ Anti-cosmic veto eliminates >90% of cosmic ray induced backgrounds

➤ Nitrogen purge enclosure keeps radon very low

➤ Option for NaI Compton suppression can reduce the self-interferance of sample isotopes with each other
System Design (Cross-section)
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Nal annulus for anti-Compton veto
(Optional, for future development)
Historical Background Comparison and Expected Improvement Results

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Expect to go from here

… to here
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Expect >10x increase in sensitivity

Schedule for ULB Detectors at RL-16

- Underground lab construction completed
- Two ULB gamma detectors and Lynx DSA units received
- Parts are in hand for shields and enclosures including clean lead and copper and cosmic veto panels
- Goal is to have ULB detector in operation and certified by the PTS near the end of 2011
- Existing RL-16 gamma detectors will remain operational indefinitely for additional capacity, as backup systems, and for high-level samples