Cleanliness

Steve Dye

WATCHMAN 5/21/18

Cleanliness Starts Yesterday

- Detector Components
    - Internal (U, Th, K inside component materials)-
        - Run detector simulations to establish allowable levels
        - Specify levels and tolerances for manufacturer
        - Test manufacturer samples
        - Test products on delivery (spot check or each piece?)
        - Return/replace/retest as needed
    - External (Dust and dirt on surface of component)-
        - Clean before testing
        - Clean before installing

Compatibility

- Cloudy water- light attenuation (25% at 15 m std)
- Long-term compatibility of detector components with Gd-loaded water
  - Degradation of materials
  - Previous studies
  - Dedicated studies
  - How long is long enough?

Site

- Cavern stability materials (concrete lining, shotcrete, etc.): minimize radioactivity and mass
- Radon barrier (MineGuard?)
- Tank base materials (concrete pad, gravel subbase, etc.): minimize radioactivity and mass (or elevated tank- columns on subsurface concrete foundations)
- Air filtering and circulation pattern: clean to dirty
- and…

Tank

- Outers: Minimize SS and (if possible) radioactivity in the SS (60Co, 137Cs)
- Welding: Minimize nasties
- Inside surface: pickle and passivate (electropolish?)
- Minimize flanges: each penetration can compromise cleanliness
- Innards: Minimize material for PMT support, housings, etc. and (if needed) radioactivity in the material
- Compatibility with Gd-loaded water
- and…

PMT

- Minimize PMT glass and (if possible) radioactivity (U, Th, K) in the glass (LRI)
- Minimize radioactivity and mass mass of material in any PMT-related material that goes inside detector
- Spherical PMT surface recommended
- Compatibility of housings, potting material, cables, etc. with Gd-loaded water
- and…

Water

- Minimize radioactivity (U, Th, K) in Gd-sulfate
- Ensure 222Rn not pumped into tank along with circulated water
- Create radially outward circulation pattern (if possible) to ‘sweep’ out 222Rn from PMT glass
- and…

Calibration

- Minimize number of glove boxes: each one potentially compromises seal
- Use only (if possible) natural sources for energy calibration
- Minimize radioactivity and mass of material in any calibration device that goes inside detector
- and…

Installation/Cleaning

- Define processes, reporting requirements
- Monitor cleanliness regularly

Collective Responsibility

- Everyone and every task needs to be clean
- Even one accident could set back the experiment