



ANNIE - Calibration with a Neutron Source

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ANNIE Weekly Meeting

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The Big Picture (from Jonathan Eisch)

- Test A
 - The first test we'd like to do is to take the source as it is, and test our detector rate with the source on top of the tank (on the hatch) and beside the tank.
 - The results of this test will inform the next steps, therefore we would like to do as soon as possible.
 - We will have 2 properly trained people by next week.
- Test B
 - If the test with the source external to the tank did not change the rates, we would like to place the source inside the tank, on top of an acrylic vessel at the surface of the water.
 - The acrylic vessel is called the Neutron Capture Volume (NCV).
 - This test would also inform subsequent steps.
- The next step, as we currently envision it, is to design a “cup” of BGO crystal (or similar) where the source can be secured inside the “cup”.
 - The bottom of the “cup” would be optically coupled to a PMT and the “cup”/PMT assembly would be wrapped to be light-tight to external light.
 - If the first test (Test A) showed that neutrons could travel some distance through the lid or some water, we would use this apparatus outside the tank, to test the time it takes neutrons to travel into the NCV and be captured on the Gadolinium.
- Test C
 - Necessary if Test A fails would be to enclose the BGO “cup” and PMT in a water-tight housing and lower it into the tank.
 - Initially it would be on top of the NCV (as in “Test B”, but later would be submerged to various depths (probably attached to the cable holding the NCV).

Tuesday 8/23

- Geoff toured the ANNIE Hall with Sue McGimpsey
 - Preliminary finding from Sue is that Test A can proceed
 - Sue is filling in for Kathy Graden
 - The date of Kathy's return is soon but not set
 - Radiological Control Technician (RCT) is on vacation this week, returns next week
 - RCT assists with mounting source safely
- Preparations for Test A
 - Sue will begin the Radiological Work Permit (RWP) based on the information from this tour
 - Next week, work with RCT to build a structure to mount the source outside the tank on top and to the side
 - Size of the neutron source – 3 feet 6 inches long
 - Training for ANNIE collaborators
 - Restrict access to Hall while source is deployed there

Neutron Source

~ 3 feet 6 inches



- **3 foot handle keeps source at a distance.**
- **Can't store in the hall because of the length.**
- **Delivered in 5 gallon bucket lined with plastic?**

Test A Planning

- Source outside the tank in two locations
- Procedure
 - Source is delivered in the morning
 - Placed on top of the tank or next to the tank in pre-built holders
 - Source is collected at the end of the day, about 4 pm
 - Is it possible to keep source in the Hall and outside the tank for days instead of working hours?
- Restrict access to the hall while the source is in position
 - Keep the door to the hall locked
 - Provide keys to Fermilab Rad Personnel – 2 keys?
 - Restrict access to other keys
 - Don't leave other keys out for anyone to pick up
- Signage
 - On the door to the Hall
 - On the railing swing door that gives access to the top of the tank on the 2nd level

Questions from ANNIE

- We would like to simulate the emission from the source and run it through Monte Carlo simulations, so any information that would help us with that, like simulation code, existing simulations, schematics of the source (thickness of the steel casing, volume of the Cf sample, etc.) would be appreciated.