**Building 470 Pile – Foil Activation Experiment Plan**

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| Date: 11 July 2018 |  | Performed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
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| Title: | Research Plan | \_\_\_\_\_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_ |
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| Facility: WPAFB, Bld 470 | | \_\_\_\_\_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_ |
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| Source Descr: Bld 470 Graphite Pile – PuBe | | \_\_\_\_\_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_ |
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| Funds/Equipment Req:  Operation Pile with PuBe Source  Various Activation Foils  HPGe Operation – Bld 470, Rm 105 | | \_\_\_\_\_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_\_\_\_\_ / \_\_\_\_\_\_\_\_\_\_\_ |

Abstract:

1. Purpose:

The purpose of this experiment is to perform a foil activation experiment in the Building 470 pile using the PuBe source. The foils used for the experiment are indium, gold, manganses, and tungsten of various thicknesses. The foils will be counted in an HPGe to determine the activity of the foils post-irradiation. The data will be used to unfold the incident neutron spectra using Pacific Northwest National Laboratory’s STAYSL code.

2. Description / Procedure:

Detailed description here. Be sure to include timelines, equipment used, sources, experiment setup, etc.

Need more here.

(24-31 July) Irradiate foils in Bld 470 pile for 7 days (Foils are In, W, Au, Mn).

(24-31 July) Characterize HPGe in Rm 105 (repeat lab from 650).

(31 July) Measure In and Mn first. Short half lives.

(31 July – 02 Aug) Measure W and Au foils

(2-9 Aug) Analysis for research update

(9 Aug) Research Update

(9-16 Aug) Draft Project Arcticle

(9-21 Aug) Spectrum Unfolding Using STAYSL

(16-23 Aug) Create Lab Procedures

(21 Aug) Lab Notebook

(21-30 Aug) Final Analysis

(21-30 Aug) Final Project Article.

3. Safety Analysis:

a. *ALARA – Radiation Safety*

Personnel conducting the experiment will have ALARA training. This included minimizing exposure time and distance from radioactive sources. The expected sources are the activation foils, the neutron pile, and the multi-nuclide source. The neutron pile has more information available in a report performed on the energy distribution [1].

b. *Electrical Safety*

No specific electrical safety information is required. A potential danger is damaging electronics on the HPGe. The procedure for operation of the HPGe is outlined in [2].

c. *Expected Activities of Isotopes Produced*

d. *Nonstandard Procedures / Administrative Controls*

This experiment requires no nonstandard procedures. No additional administrative controls are necessary to ensure safe operation.

e. *Radioactive Material Storage and Disposal*

Radioactive materials produced through the irradiation of the experiment will be stored on-site until the short-lived isotopes have decayed. Any materials that remain radioactive will be disposed of as low-level radioactive waste.

f. *Dosimetry Requirements*

All samples will be surveyed for beta / gamma radiation upon removal from the pile. Any personnel handling the experiment after irradiation shall wear ring badges in addition to their whole-body badges if the dose rate exceeds 100 mrem/hr. The foil activities modeled will be below this requirement.

g. *Other Safety Concerns*

None applicable.

4. References:

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| [1] W. Johnston, "Characterizing the Neutron Energy Distribution of the AFIT Building 470 Graphite Pil," NENG 725, 2018. |
| [2] K. Choe, W. Johnston and N. Quartemont, "High Purity Germanium Gamma-Ray Spectroscopy," NENG 650, 2017. |