Moisture Detection by Neutron Moderation

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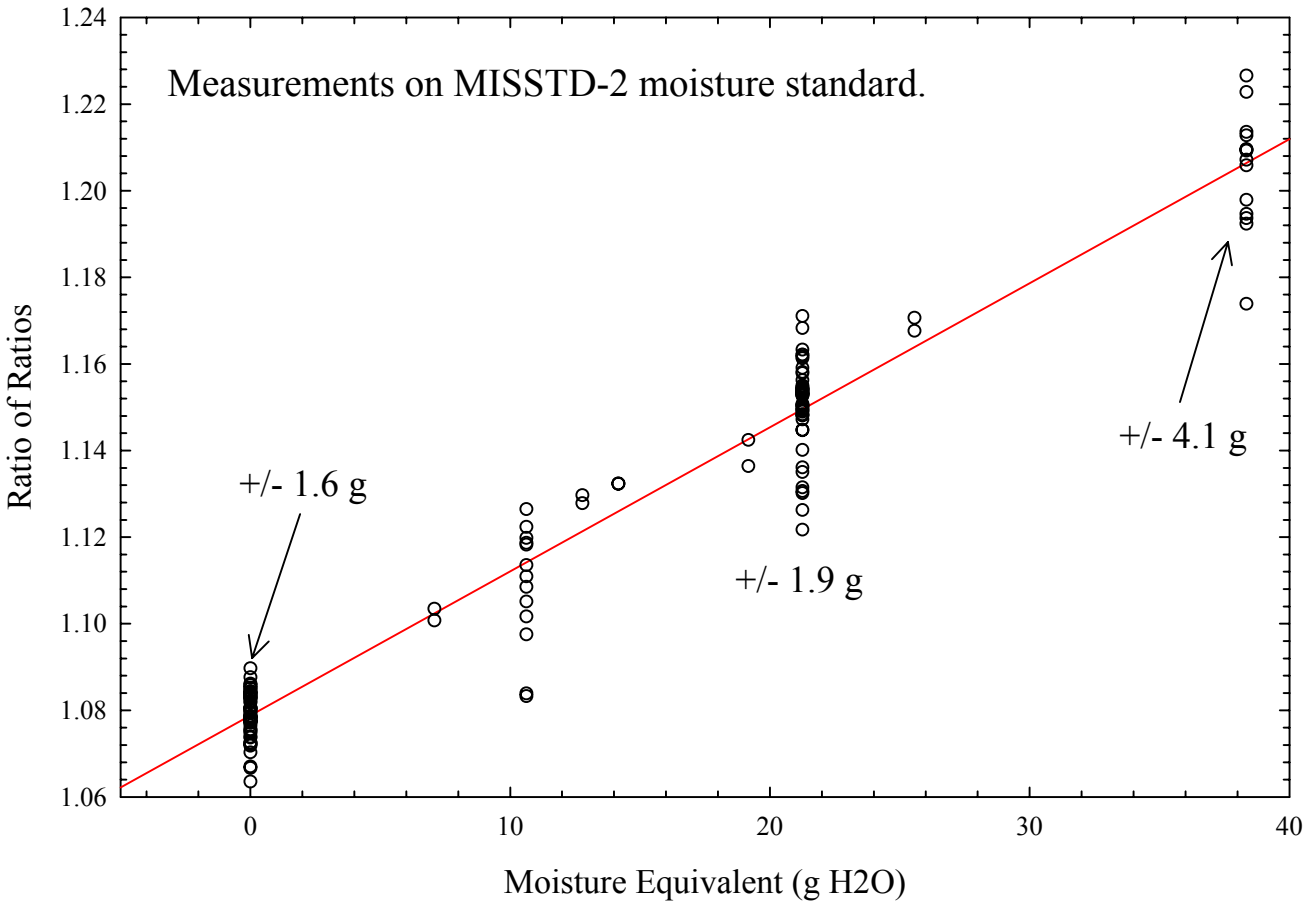
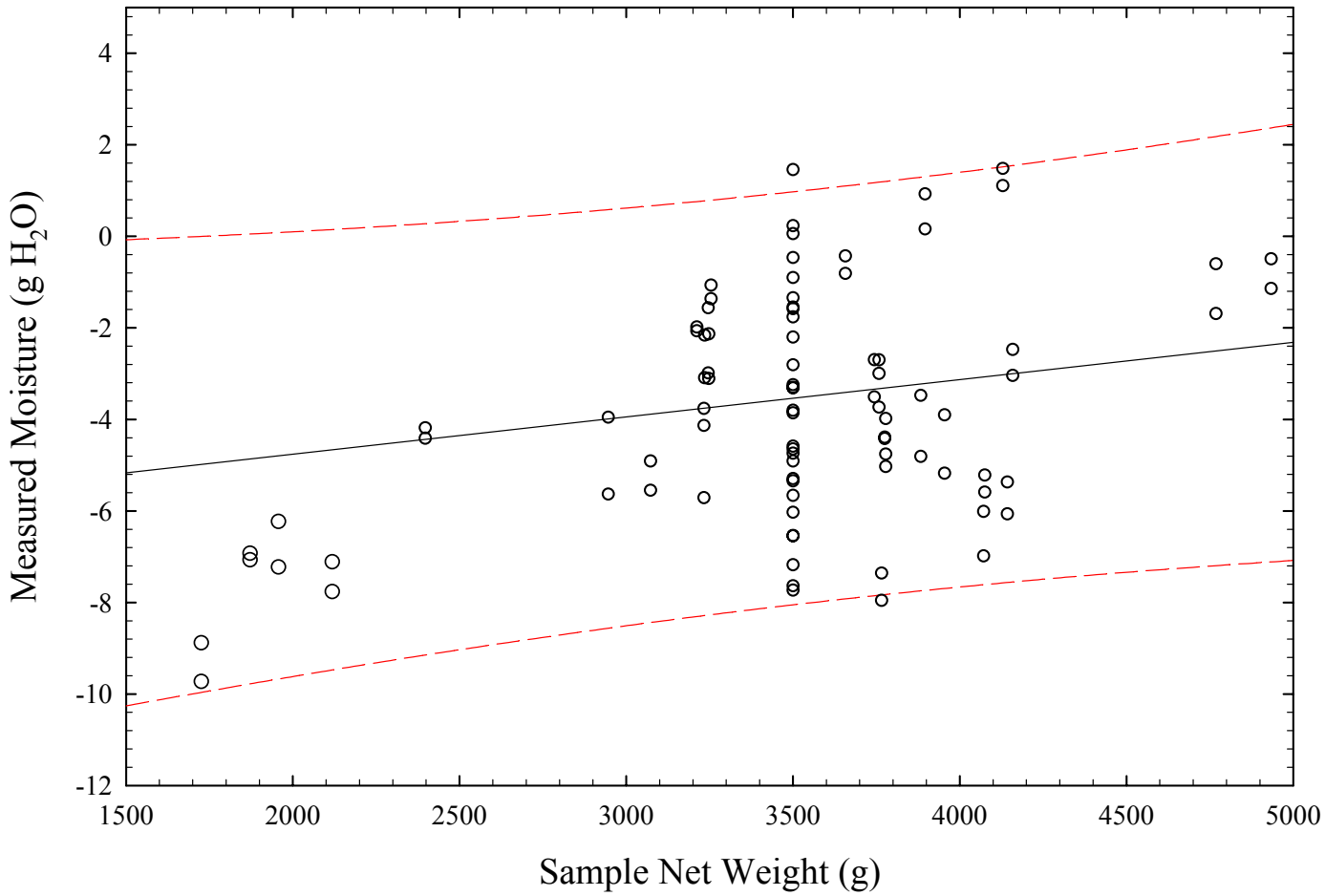
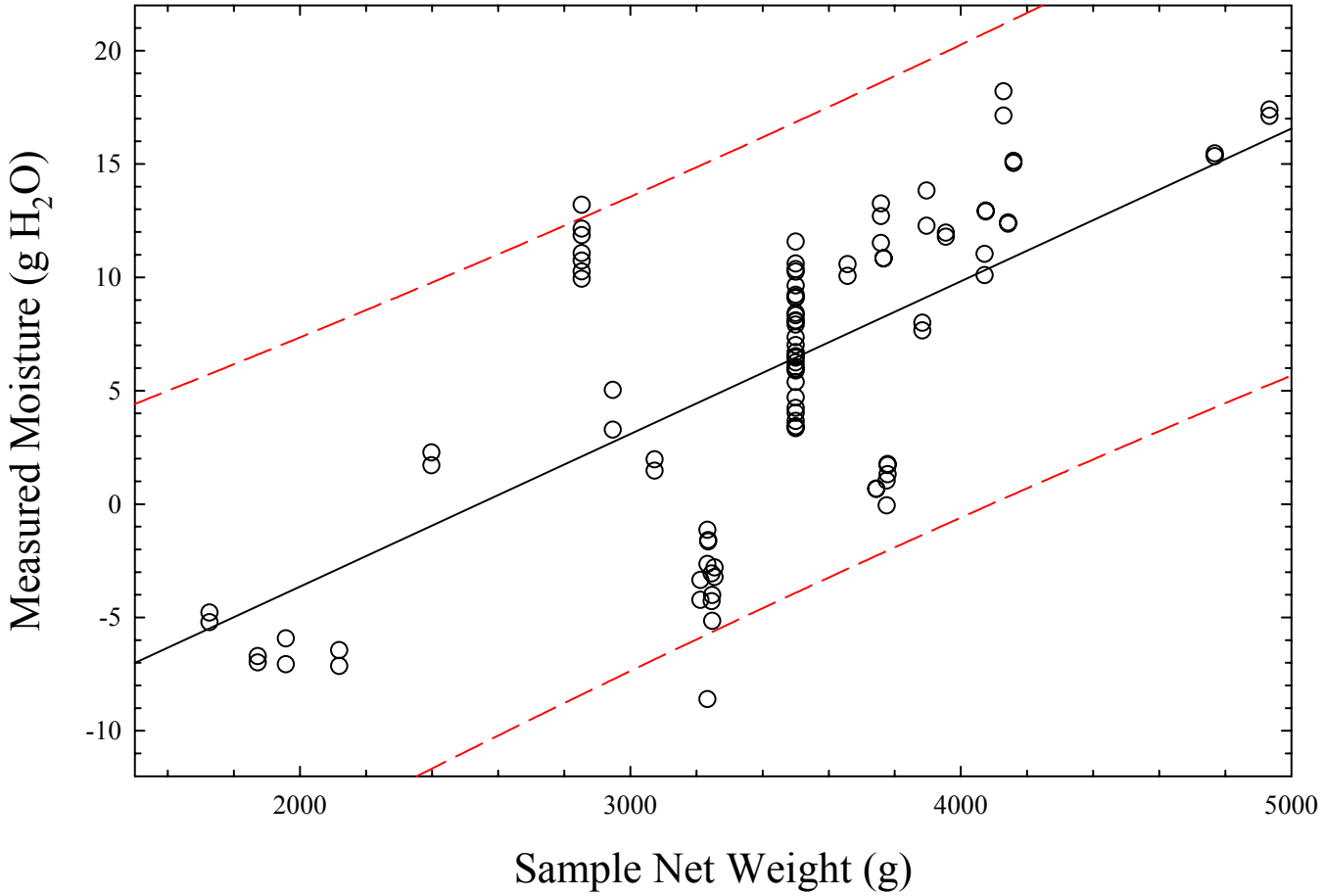
Calibration Data



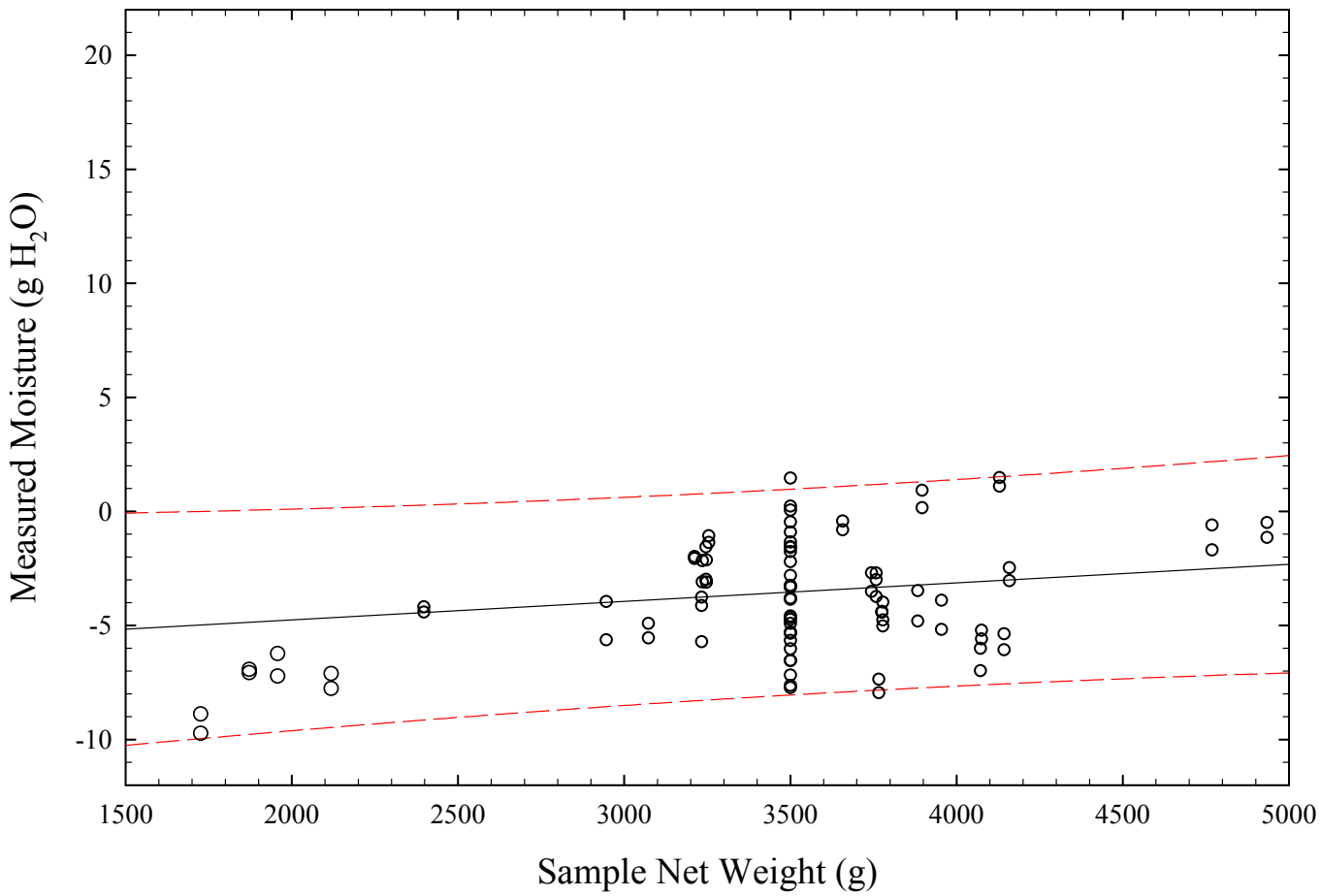
LANL Packaged Oxides



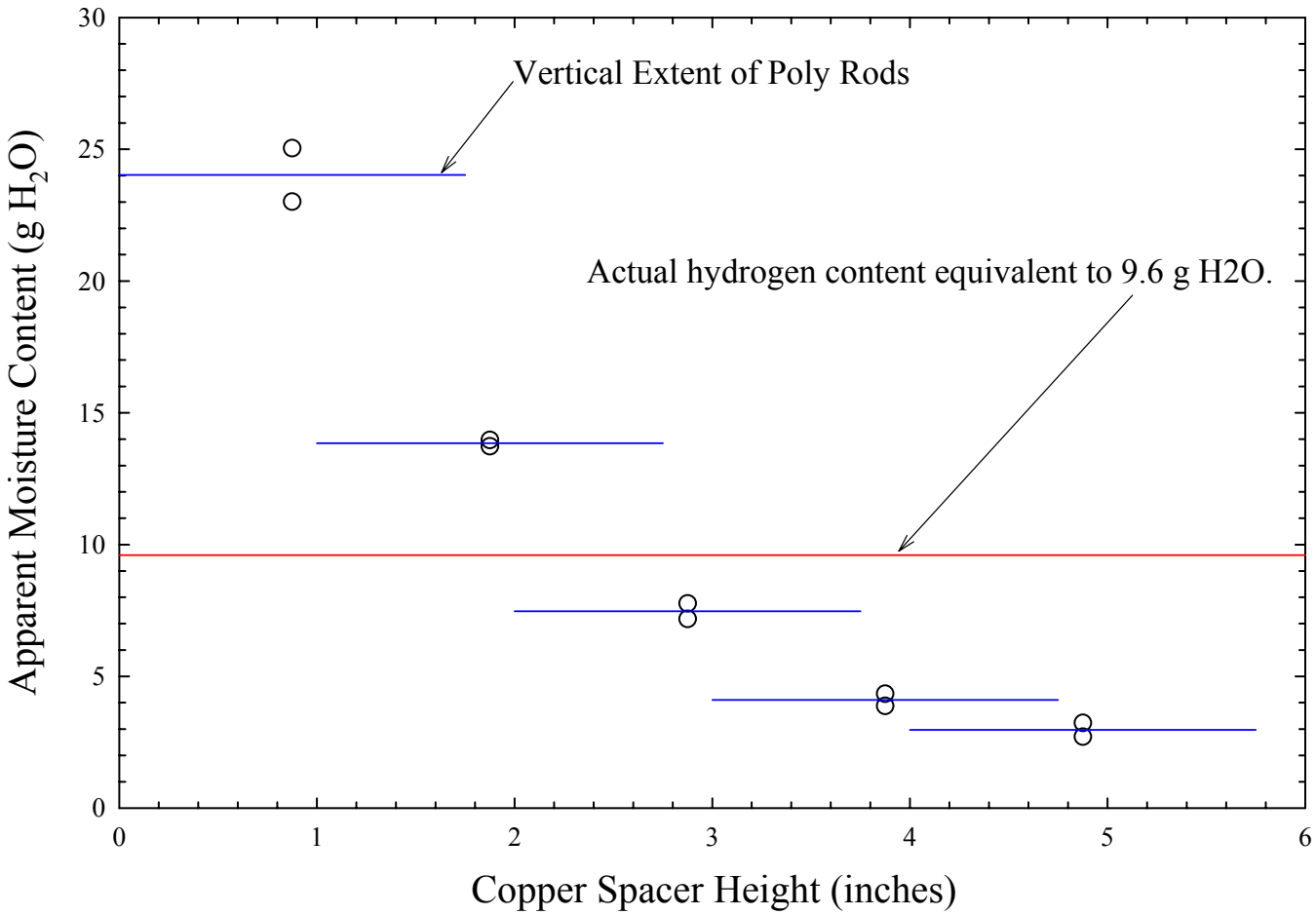
LANL Packaged Oxides – No Flux Normalization



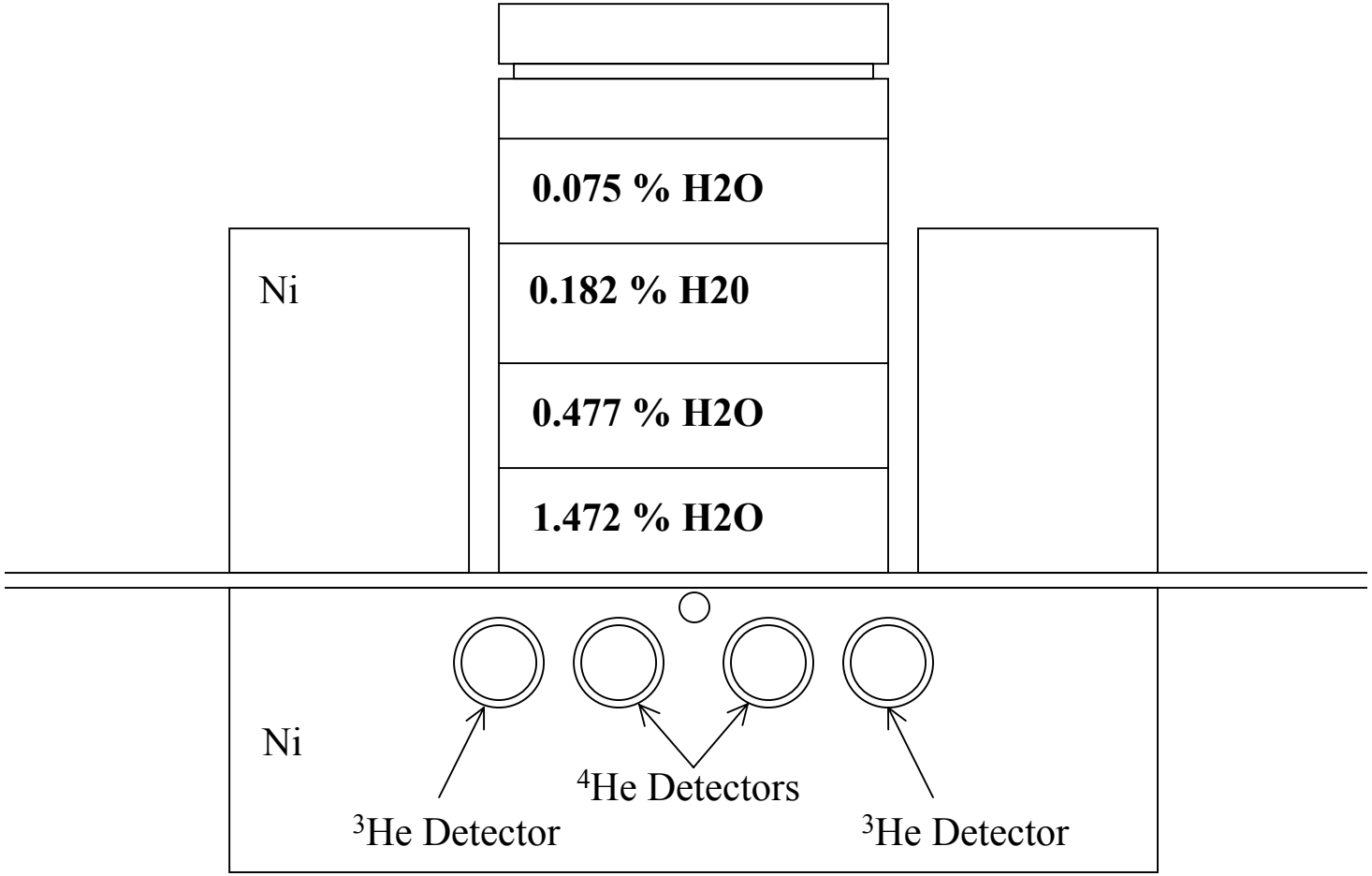
LANL Packaged Oxides



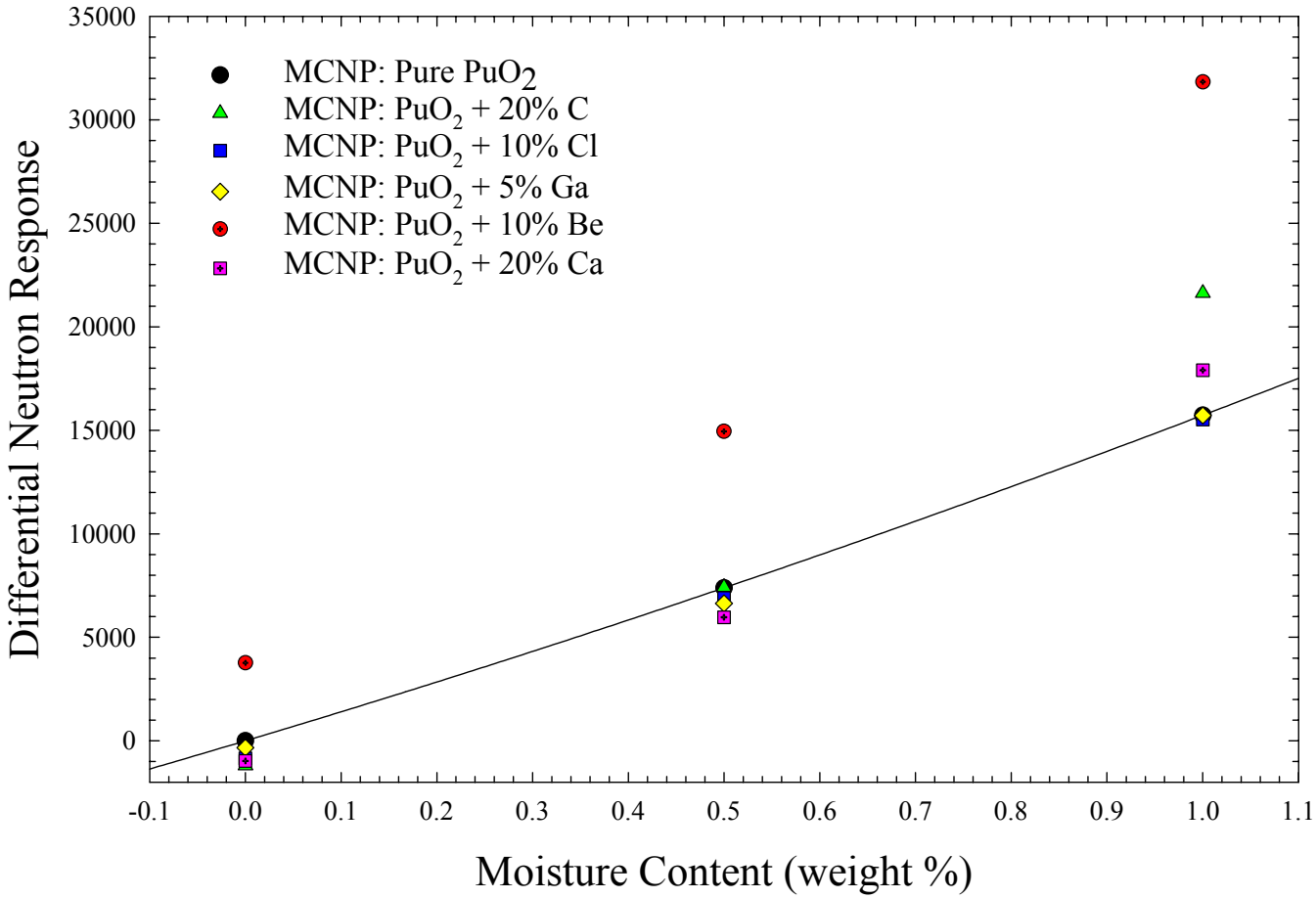
Vertical Response



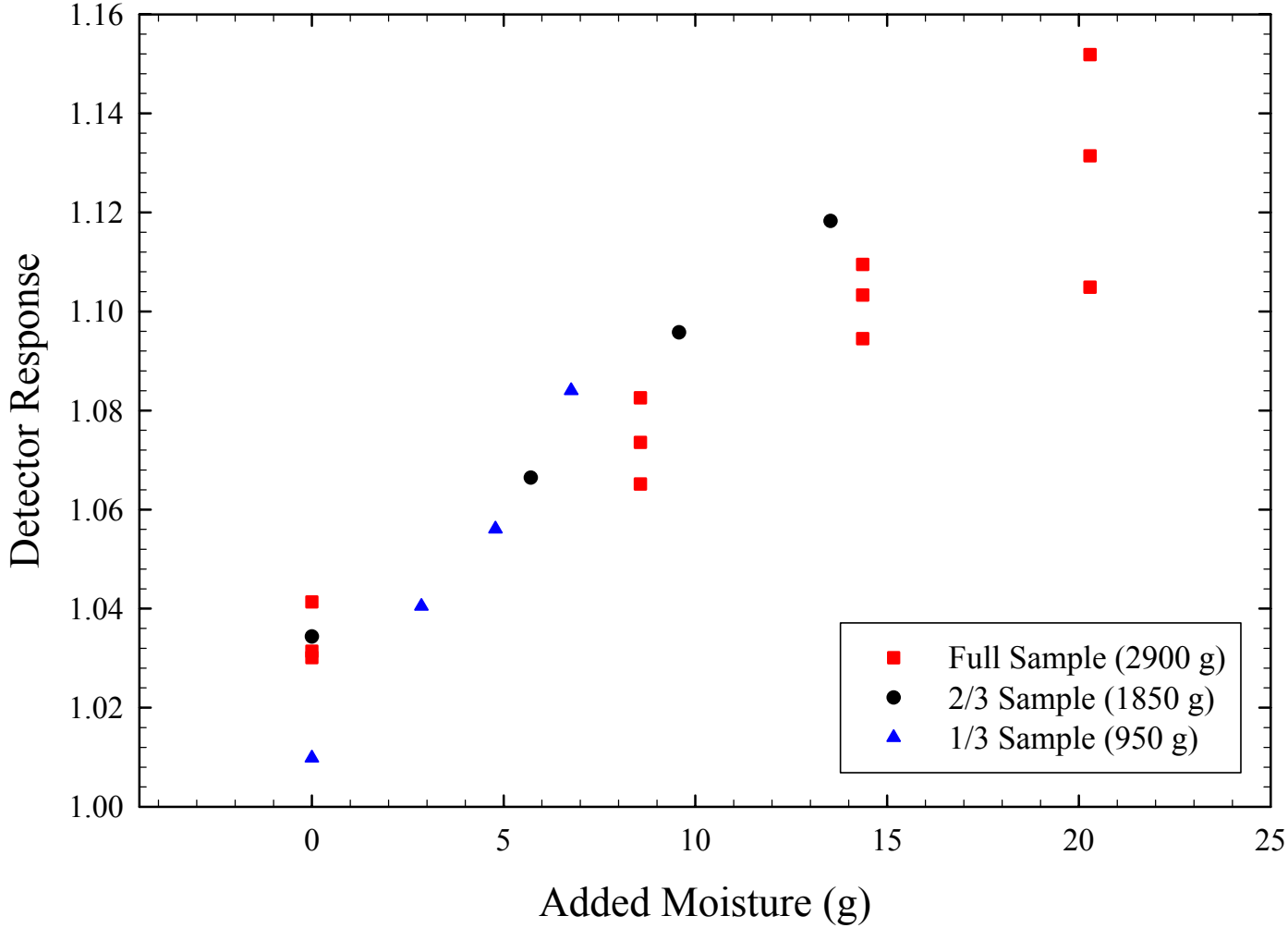
Vertical Response - MCNP



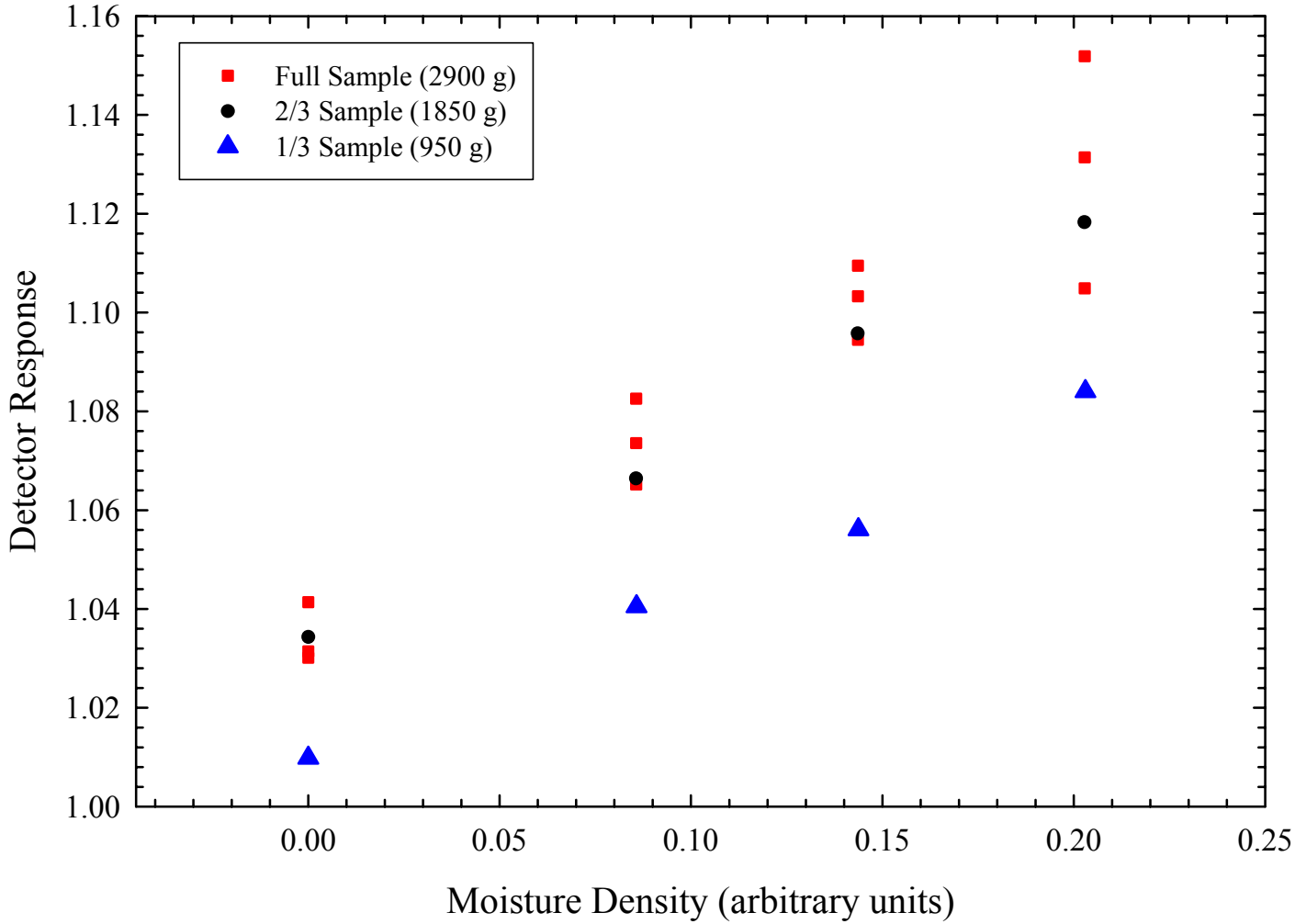
Impurity Response - MCNP



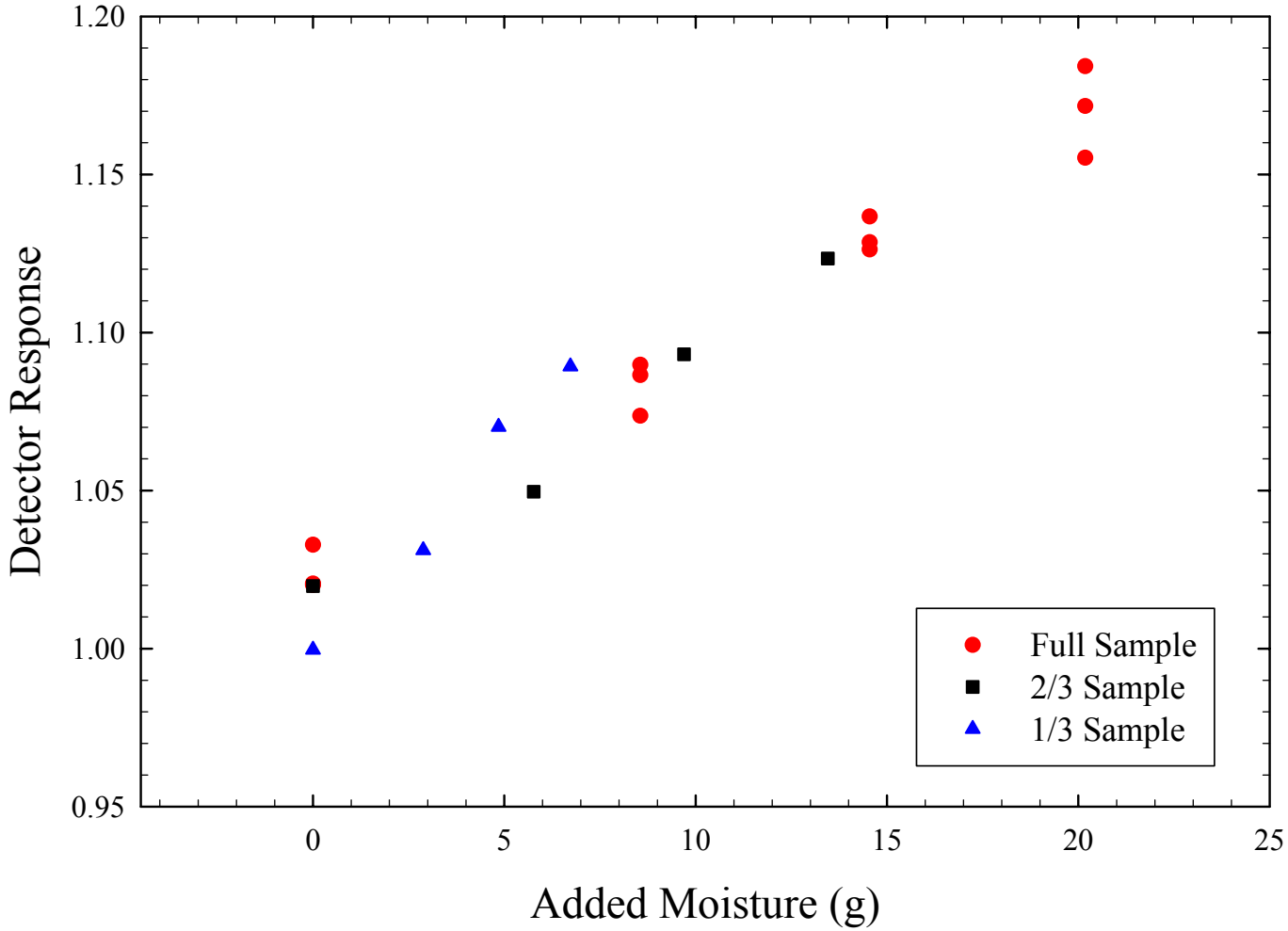
Measurements on Pure Plutonium Oxide



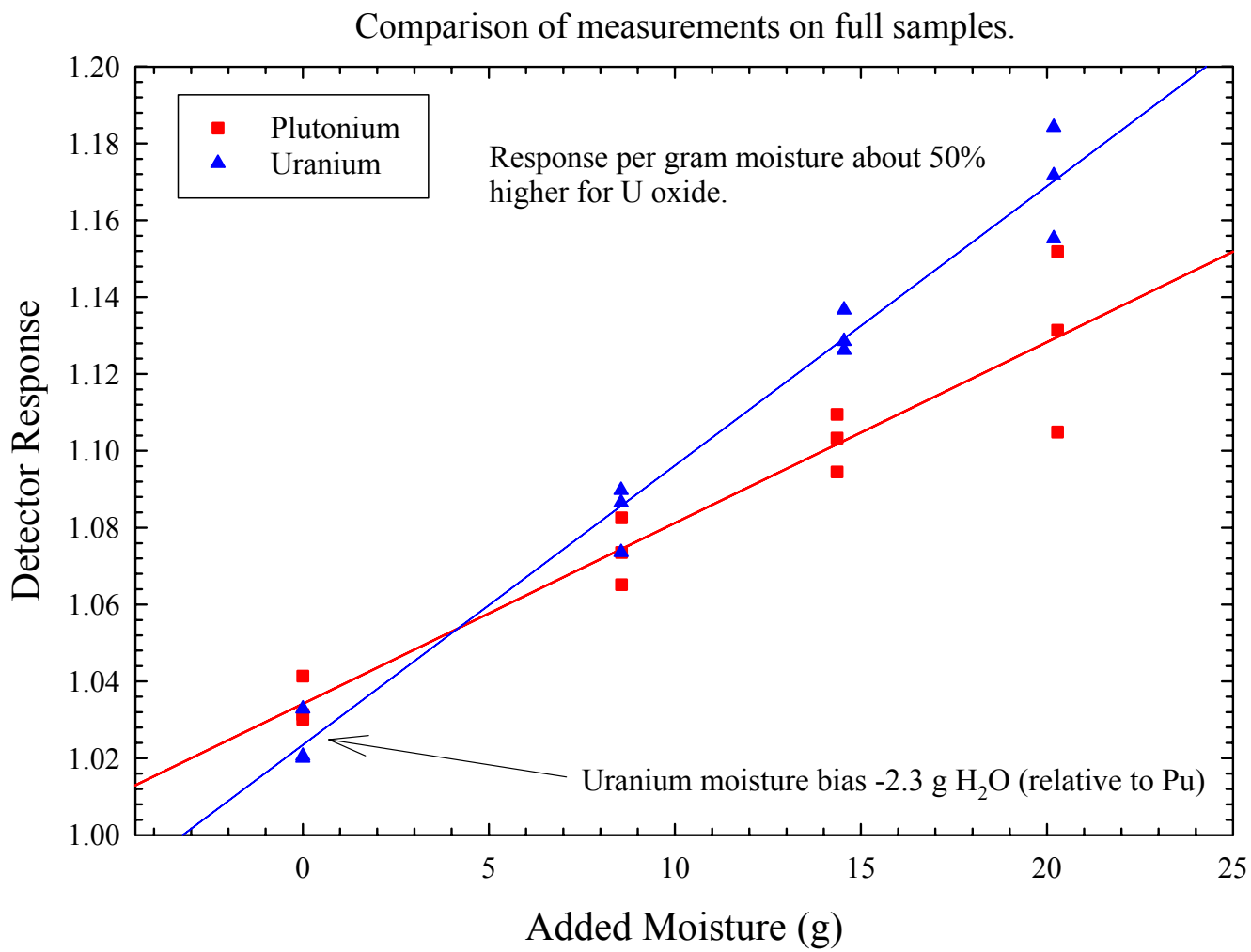
Measurements on Pure PuO_2 – cont.



Measurements on Pure Uranium Oxide



Comparison of Pu and U Measurements



Monte Carlo Modeling

Limitations in MCNP prevented accurate representation of the NM equipment:

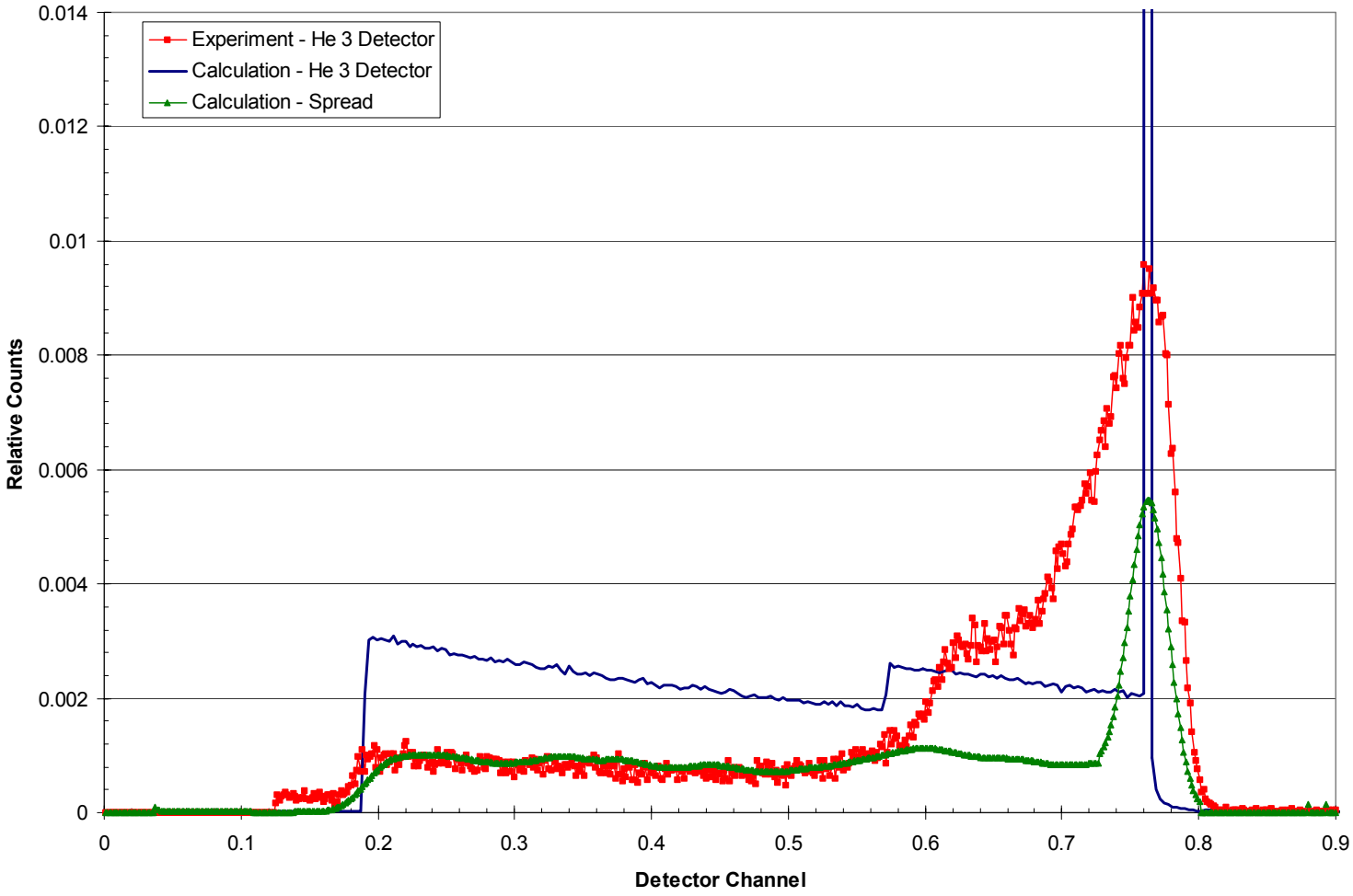
- Unable to tally the ^{4}He detector
- No mechanism to tally pulse height spectrum in ^{3}He

MCNP was modified to include the scattering kinematics and slowing down mechanism for He elastic scattering and the $^{4}He(n,p)$ absorption reaction.

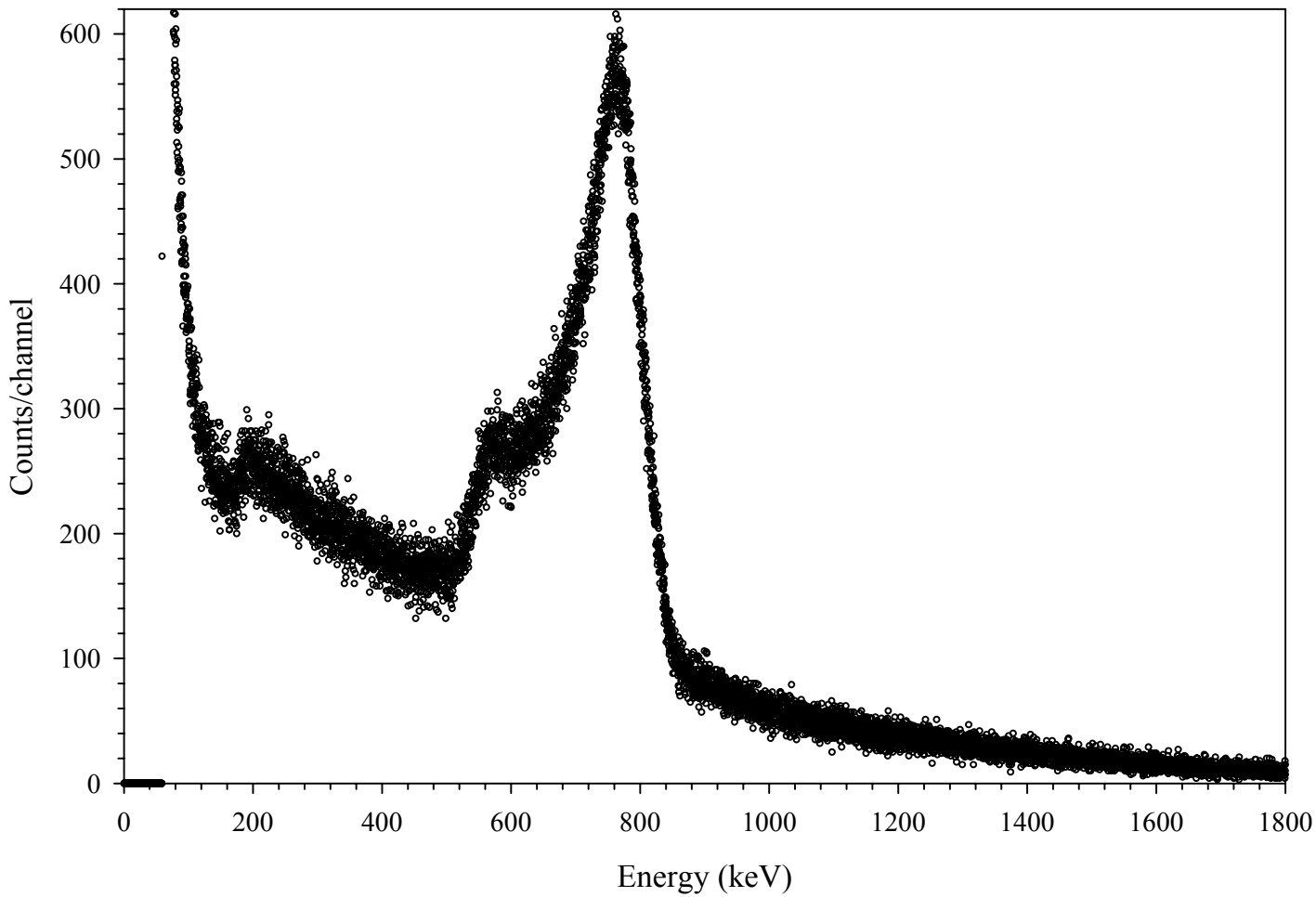
Agreement with experimental data:

- ^{3}He region of interest: -13%
- ^{4}He region of interest: 4.5%

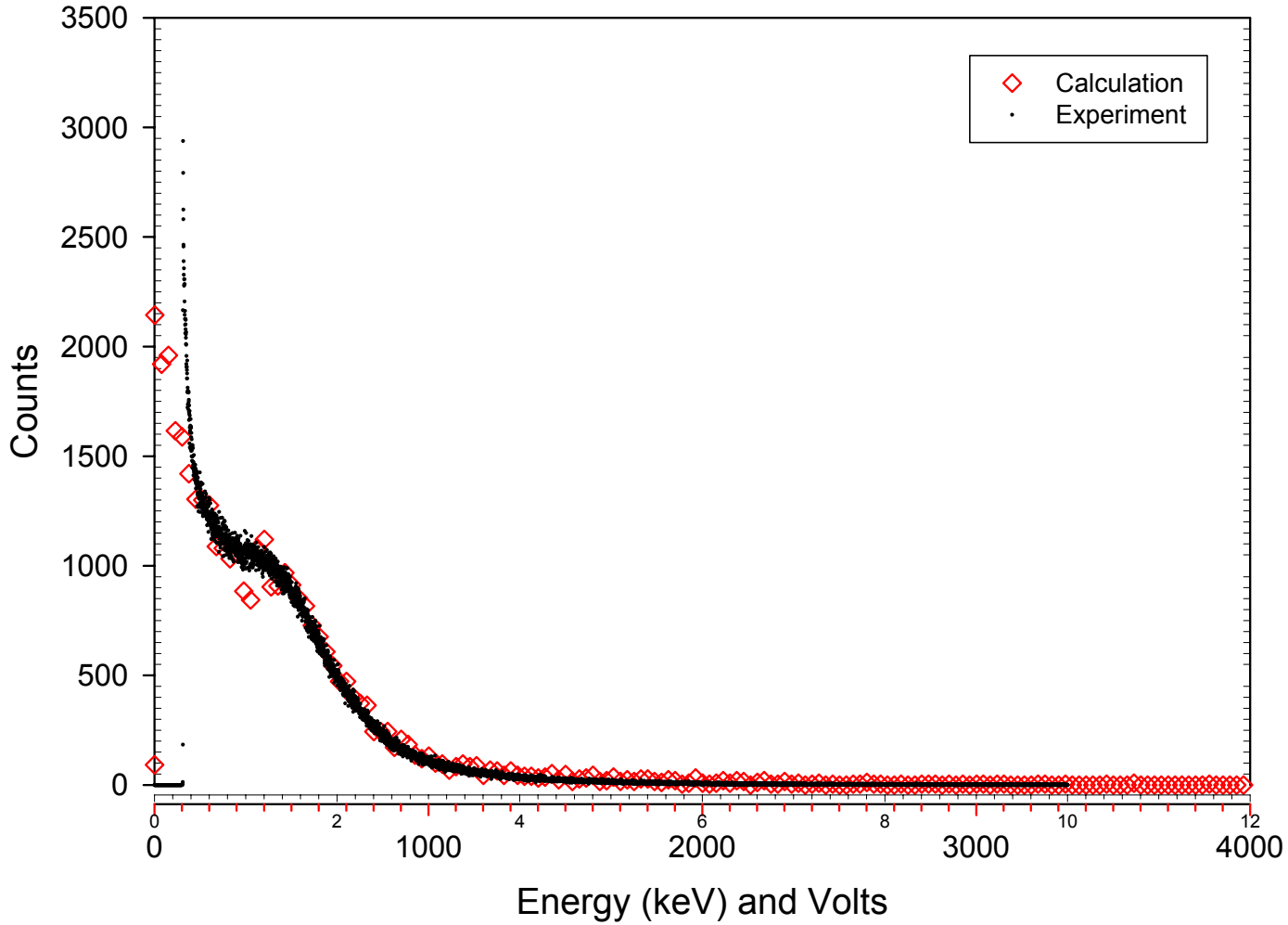
^{3}He Detector Comparison



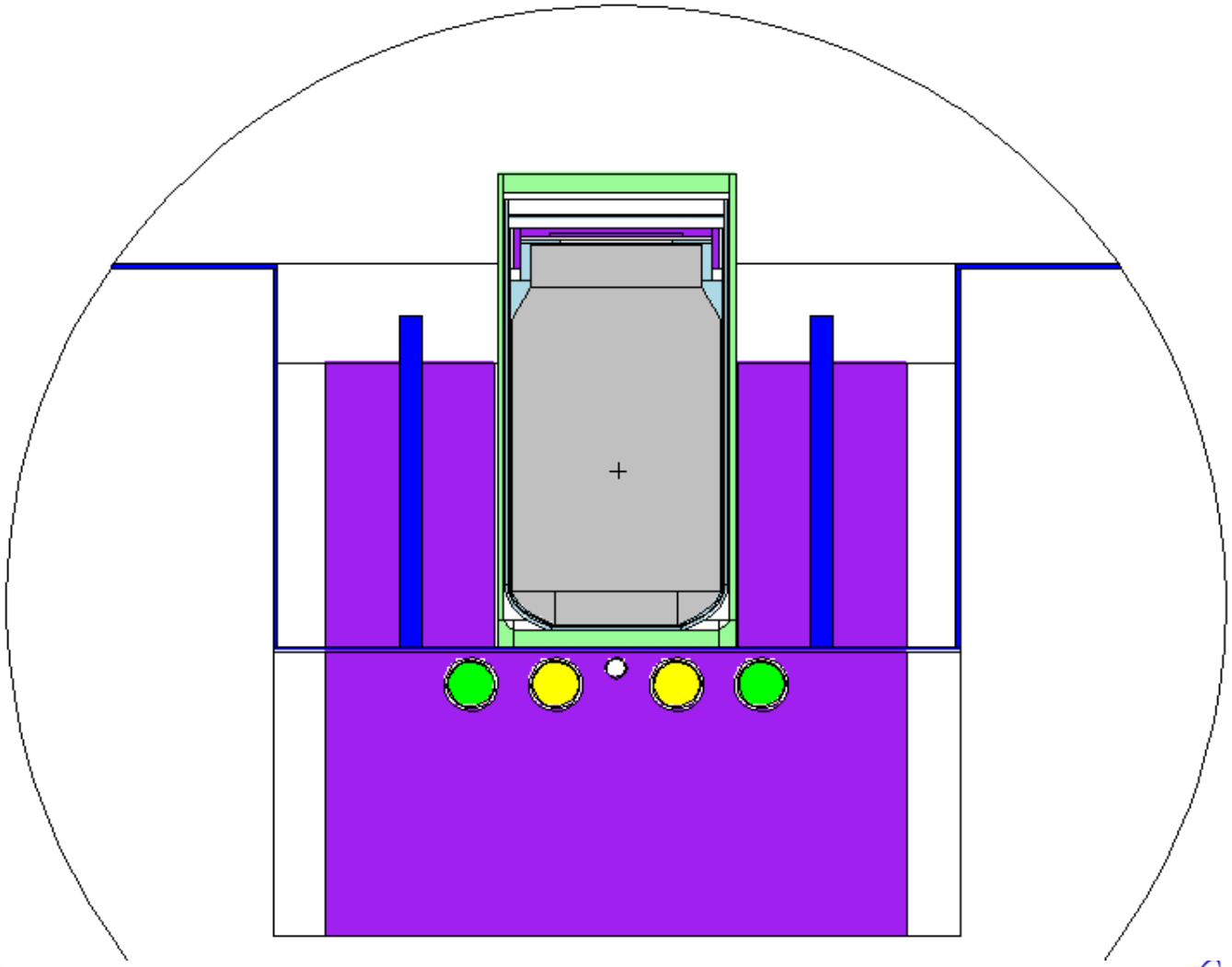
^{3}He Spectrum from Moisture Monitor



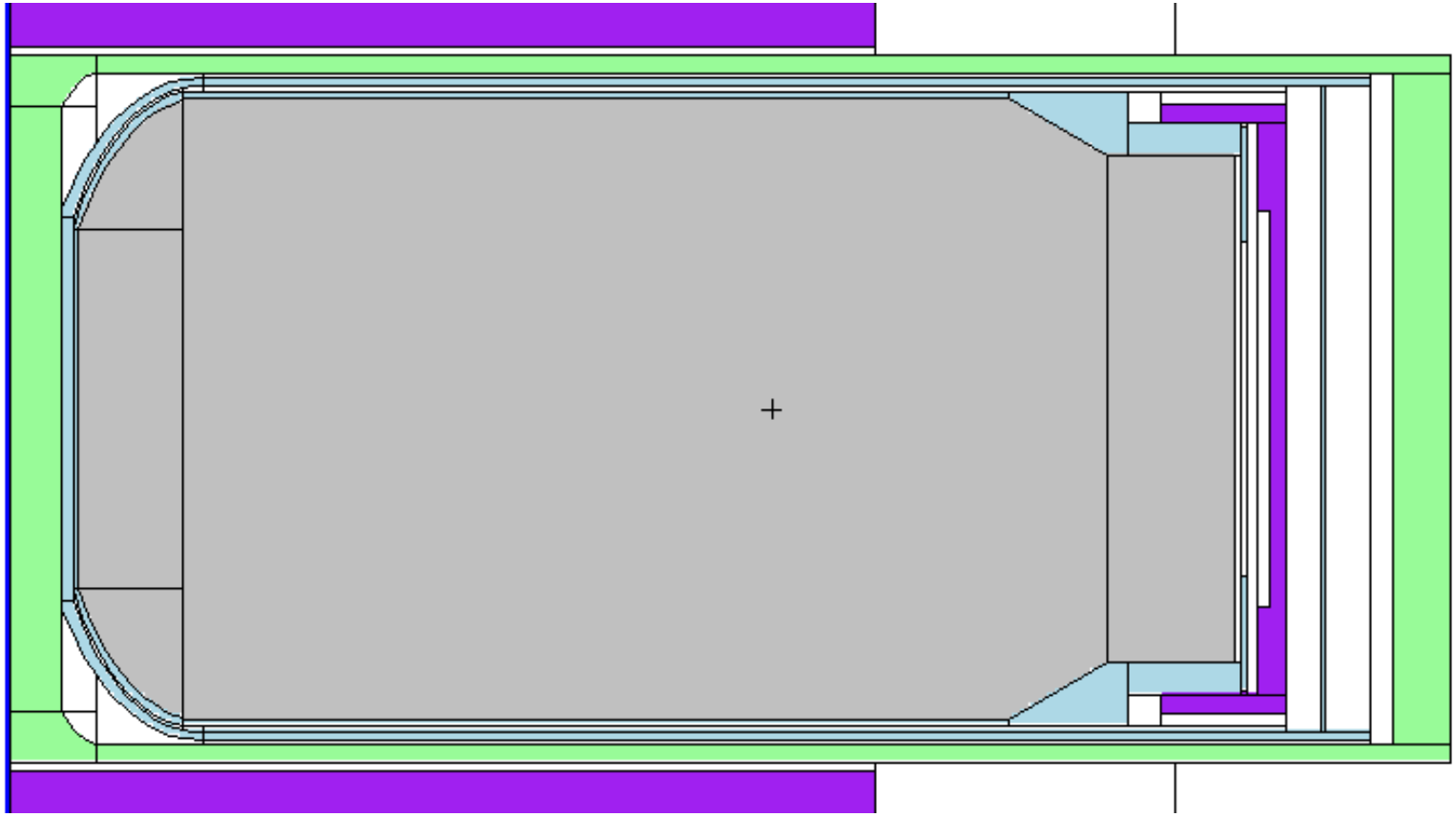
Pulse Height Distribution in ^{4}He Detectors



Full Experiment in XY View



Rocky Flats Storage Can Assembly



Hanford Field Tests

Measurement control standards (WO_3) fabricated and measured at Los Alamos to provide a baseline.

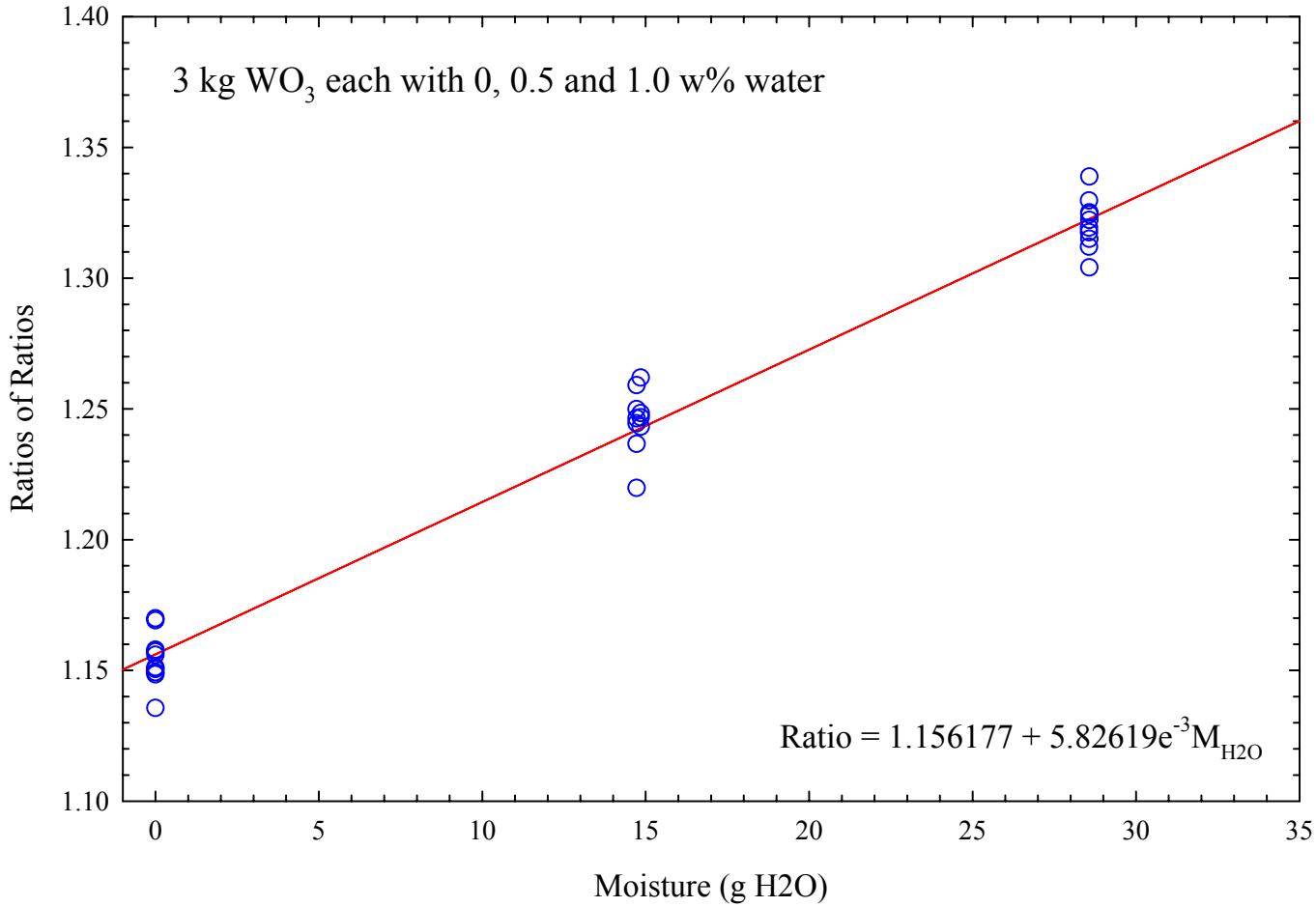
Neutron moisture monitor installed at Hanford PFP Facility.

Tungsten oxide standards were used to verify the calibration and provide a quality check while the instrument is in operation at Hanford.

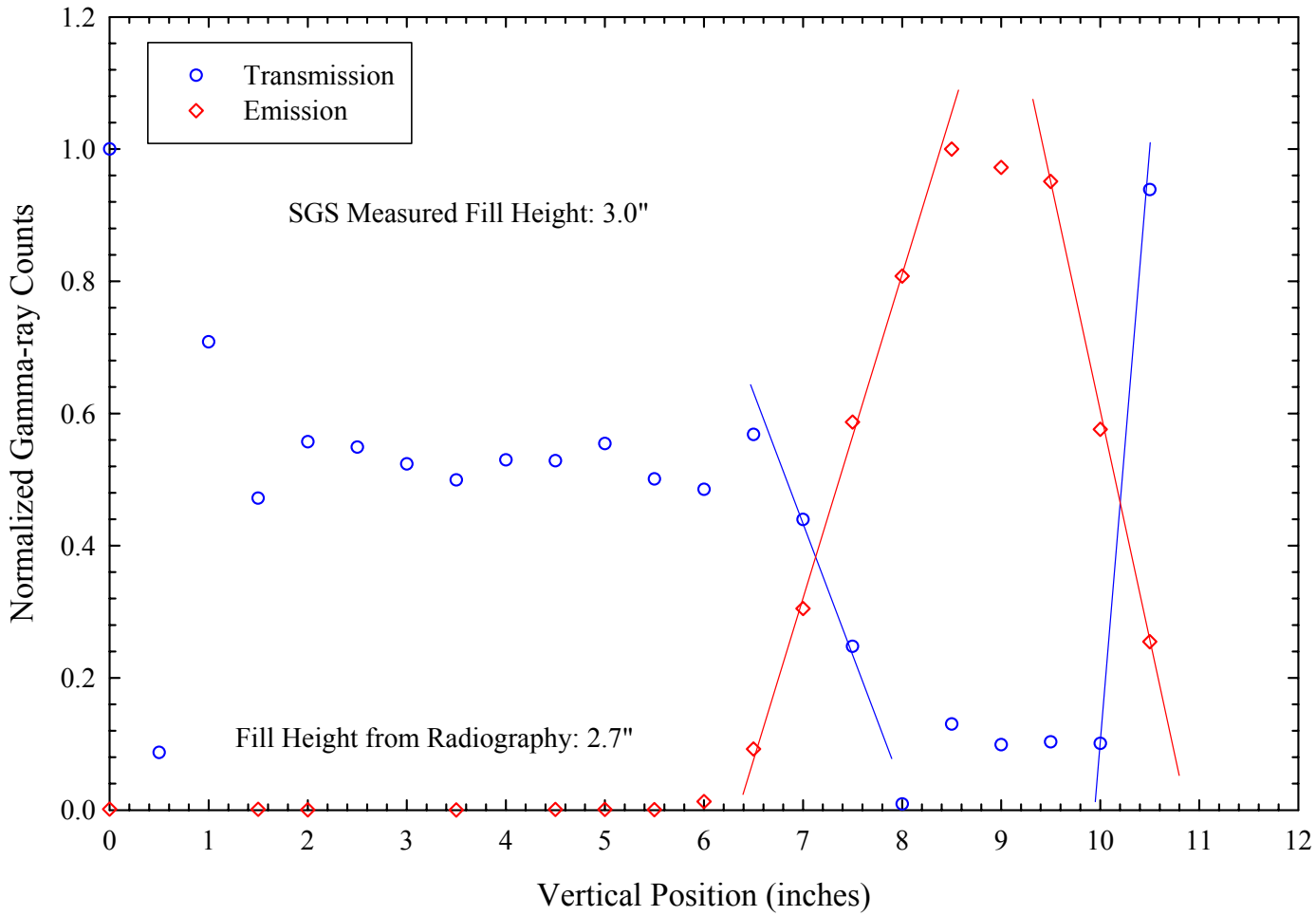
Agreement with Hanford to assay 96 plutonium oxide items using the moisture monitor with the emphasis on impure oxides.

Hanford will also provide data from an SGS for fill height determination.

WO_3 Measurement Control Standards



Fill Height Analysis



Hanford Field Test – cont.

Start with a selection of 60 items that include the following categories.

O = Metal Oxide		OX = Oxalate	
MGO = Magnesium Oxide		61 = Previously Stabilized Material	
C = Carbonate		PBO = Purex Blended Oxide	
PN = Product Nitrate		DZO = Savannah River Oxide	
CML = Critical Mass Lab		61-64 = PFP Scrap	
F = Filtrate		BM = Burnt Metal	
C&D = Cats and Dogs			

Select the next 36 items based on areas that need further work.

Neutron Moderation in FY03

Complete measurements at Hanford and analyze results.

Complete Monte Carlo parameter study. Use this information to help understand the results from the Hanford measurements.

Perform series of measurements at Los Alamos with PuO_2 and salt mixtures.