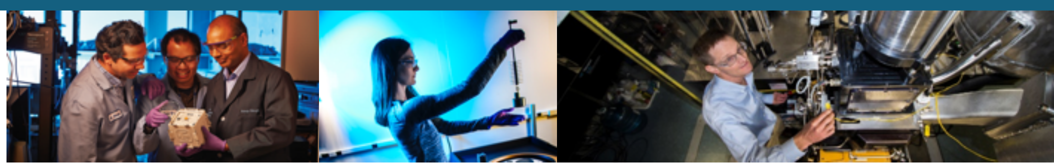
Example InterSpec Problems



PRESENTED BY

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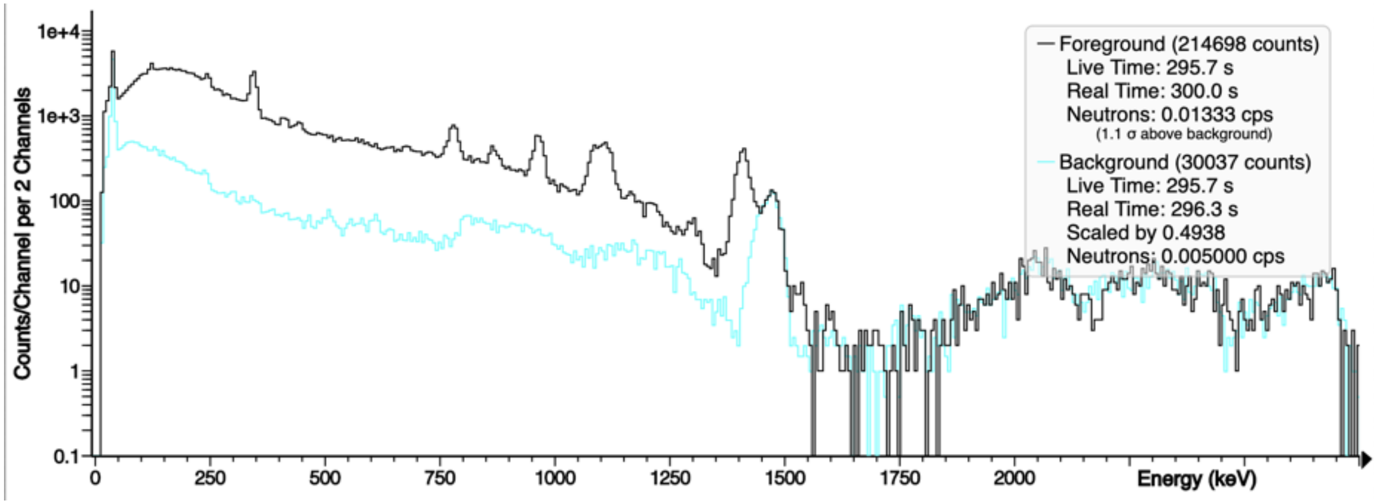
UUR SAND2020-9525 TR

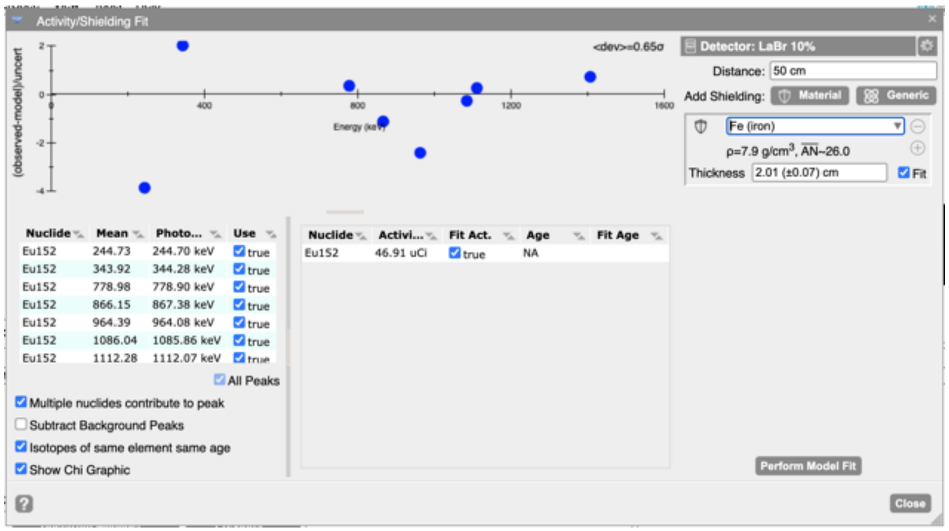
intro_LaBr_10Percent_50cm.n42



Measurement was taken at 1m with 10% efficient LaBr detector. The object was in an iron container.

- Identify primary non-background nuclide, source activity, and amount of shielding, assuming Iron

Solution: intro_LaBr_10Percent_50cm.n42



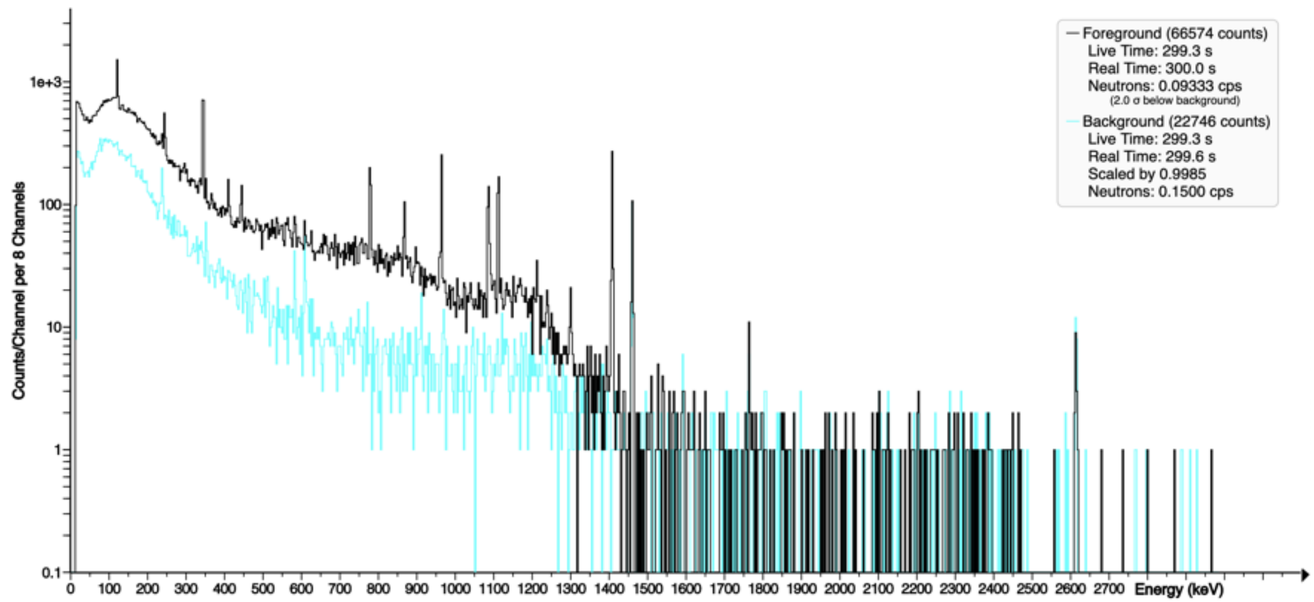
After checking energy calibration using background peaks, using the “Nuclide Search” tab, and any of the dominant foreground peaks, Eu152 is first suggested isotope and clearly correct.

Once showing Eu152 reference photopeaks, manually fit peaks in the spectrum

Using “Activity/Shielding Fit” tool, add a shielding and enter “Fe” or “Iron”, select all Eu152 peaks and click “Perform Model Fit”.

Truth: 50 uCi of Eu152 with 2cm Fe at 1m (simulated using GADRAS)

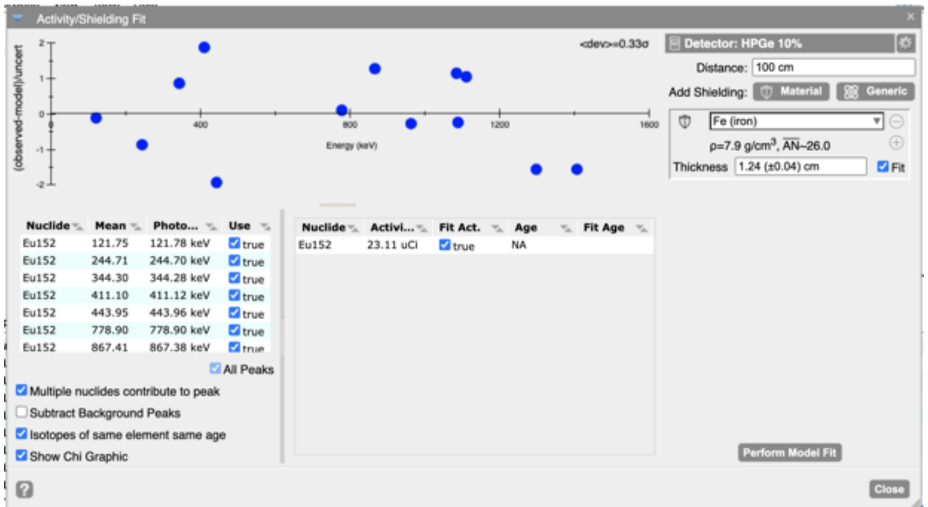
intro_HPGe10Percent.n42



Measurement was taken at 1m with 10% efficient HPGe detector. The object was in an iron container.

- Identify primary non-background nuclide, source activity, and amount of shielding, assuming Iron

Solution: intro_HPGe10Percent.n42



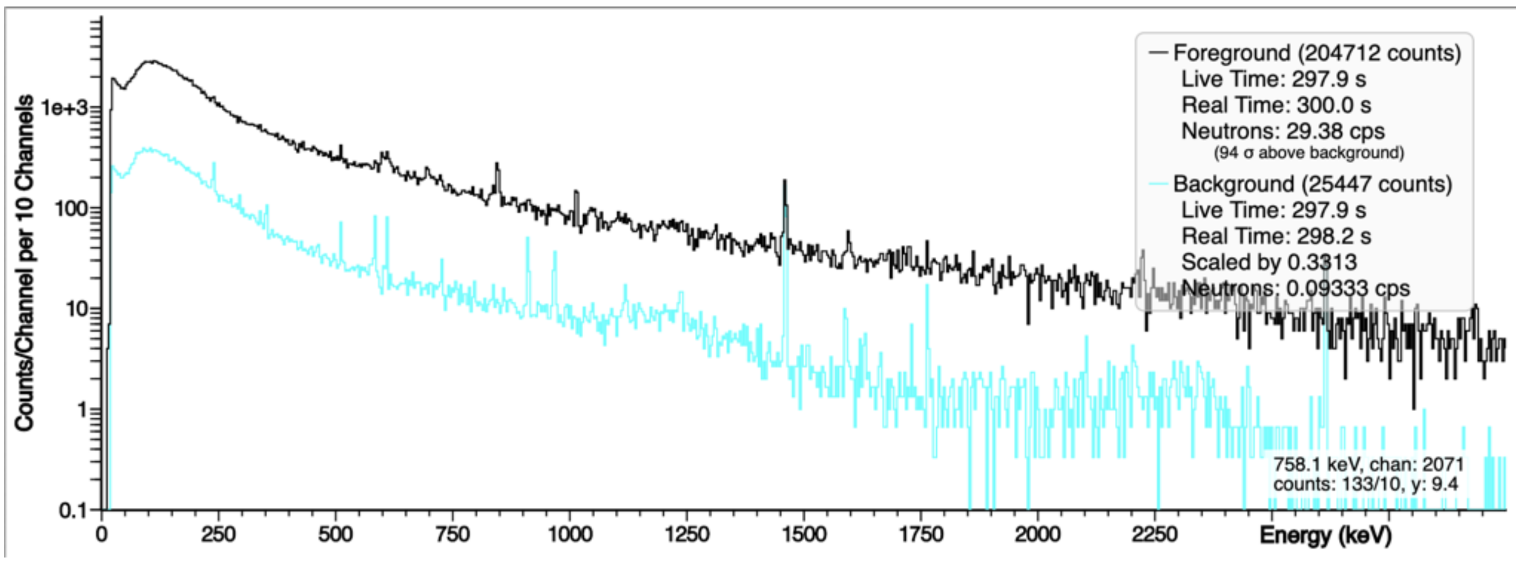
After checking energy calibration using background peaks, using the "Nuclide Search" tab, and any of the dominant foreground peaks, Eu152 is first suggested isotope and clearly correct.

Once showing Eu152 reference photopeaks, you can press the "Search for Peaks" button from the "Peak Manager" tab and most peaks will be automatically fit. Review fits and fix any not-great ones, and check Eu152 isn't being assigned to any background peaks.

Using "Activity/Shielding Fit" tool, add a shielding and enter "Fe" or "Iron", select all Eu152 peaks and click "Perform Model Fit".

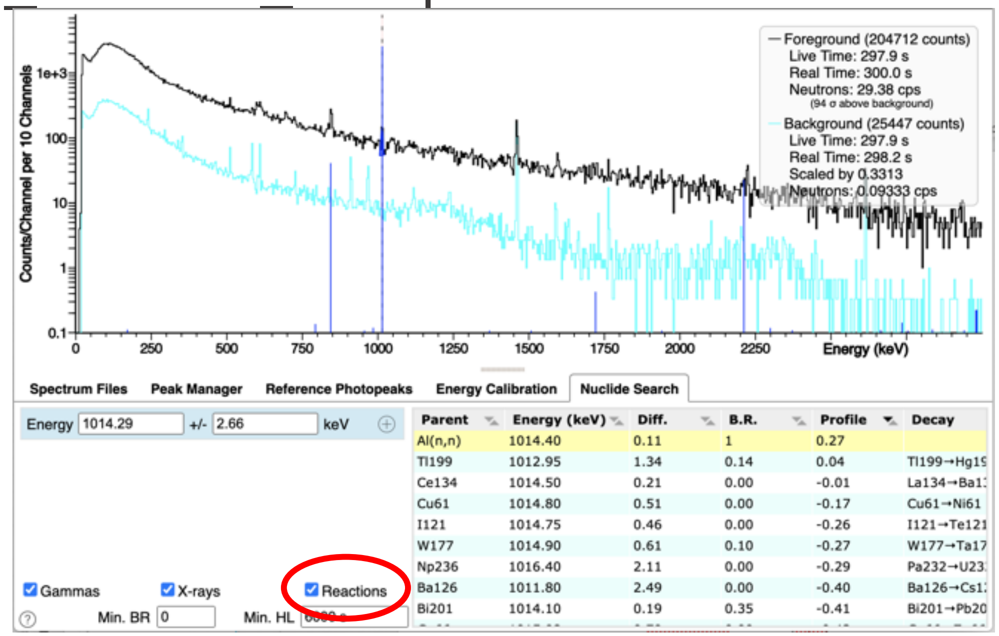
Truth: 25 uCi of Eu152 with 1cm Fe at 1m (simulated using GADRAS)

neutron_reactions_example.n42



Identify primary neutron reaction leading to photopeaks in the spectrum

Solution: neutron_reactions_example.n42

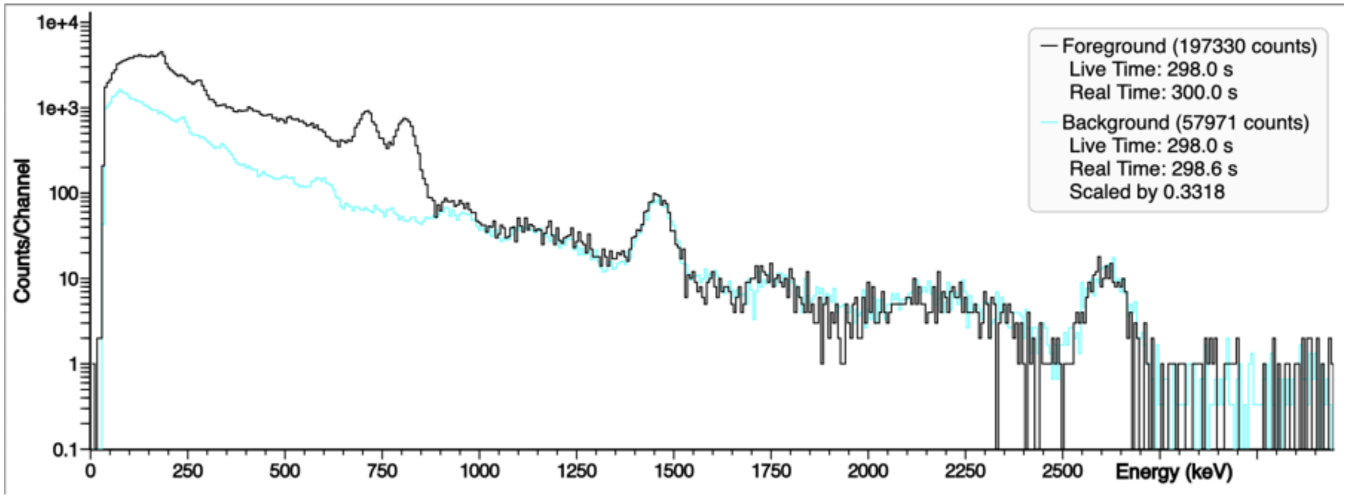


Inelastic scatter of nuetrons on Al(n,n)

Nuetron source Cf252

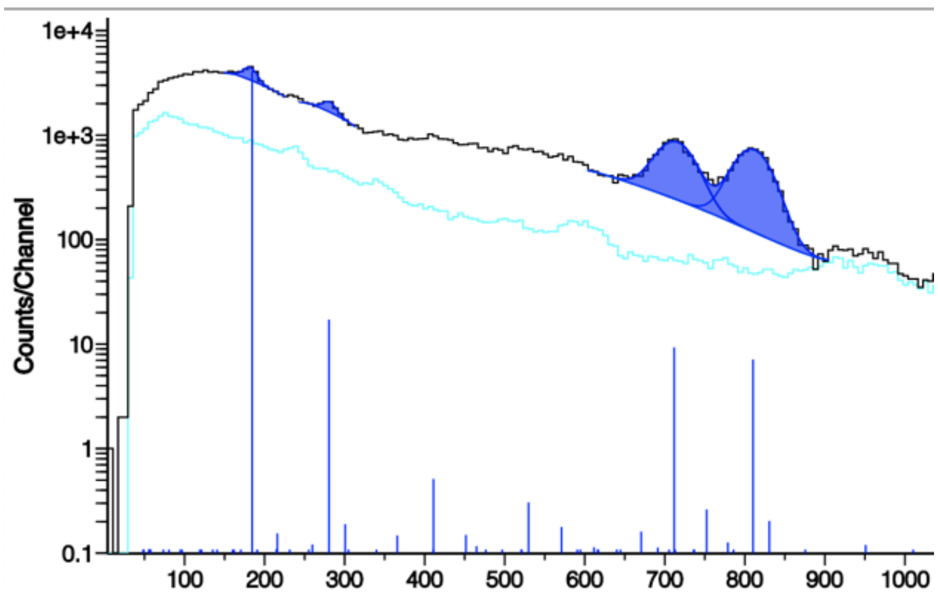
Simulated using GADRAS

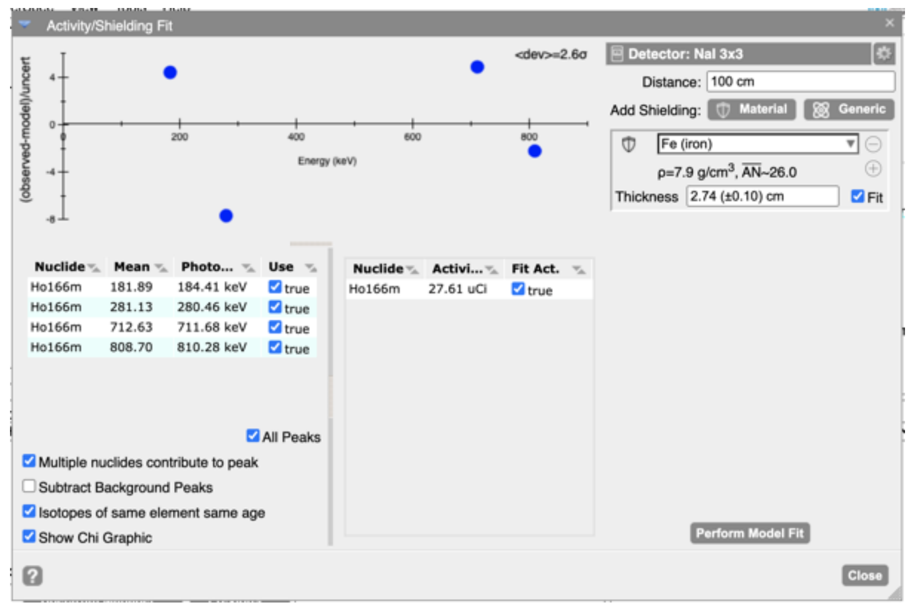
example2_FeShielding_NaI_3x3.n42



Identify primary nuclide and determine shielding thickness, assuming Fe and distance 1m.

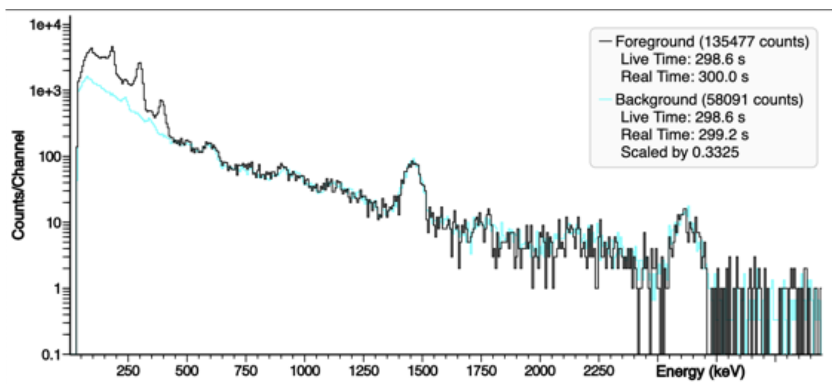
Solution: example2_FeShielding_NaI_3x3.n42

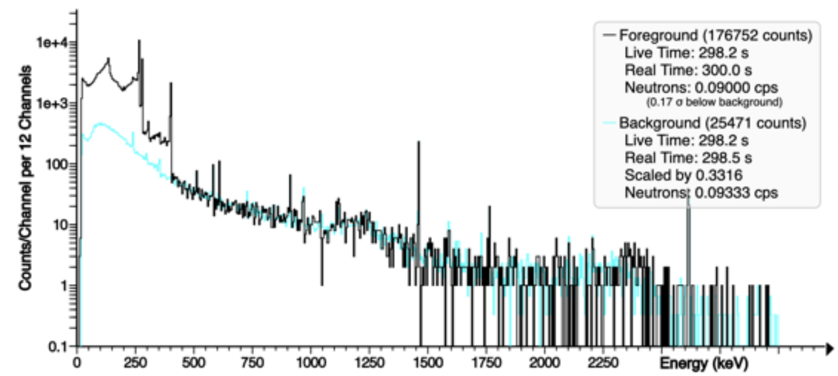




Truth: Ho166m, 2.54 cm Fe shielding, 19.1 uCi

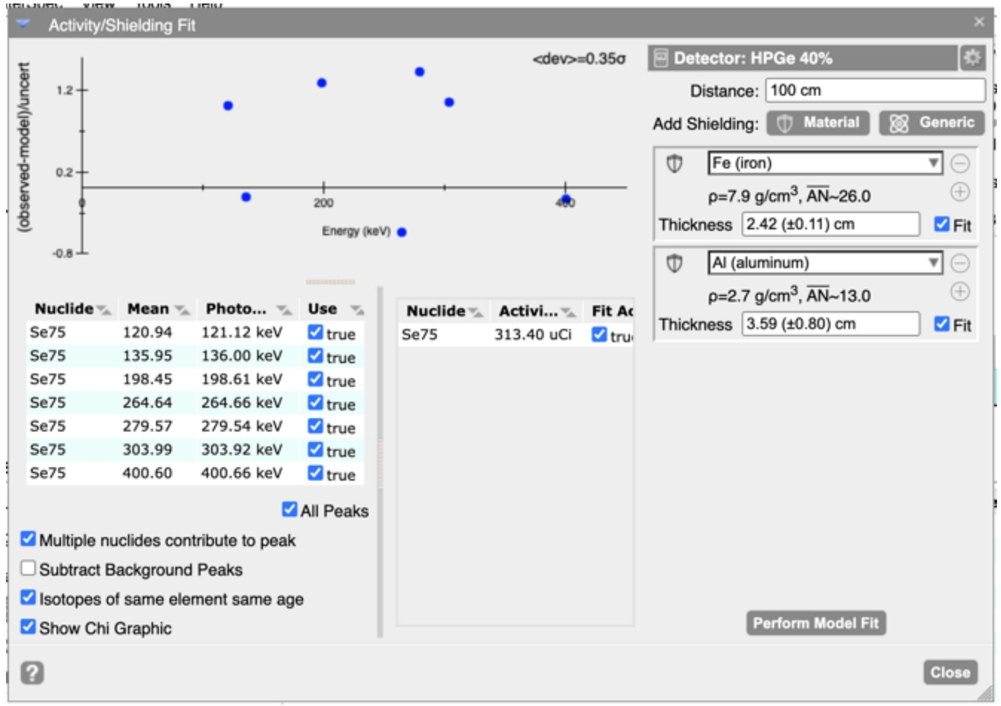
example3_Al_Fe_NaI_3x3_1m.n42 and example3_Al_Fe_HPGe40Percent_1m.n42





Pick either HPGe or NaI data, and perform nuclide ID, and fit for shielding assuming shielding is aluminum and iron and distance is 1m

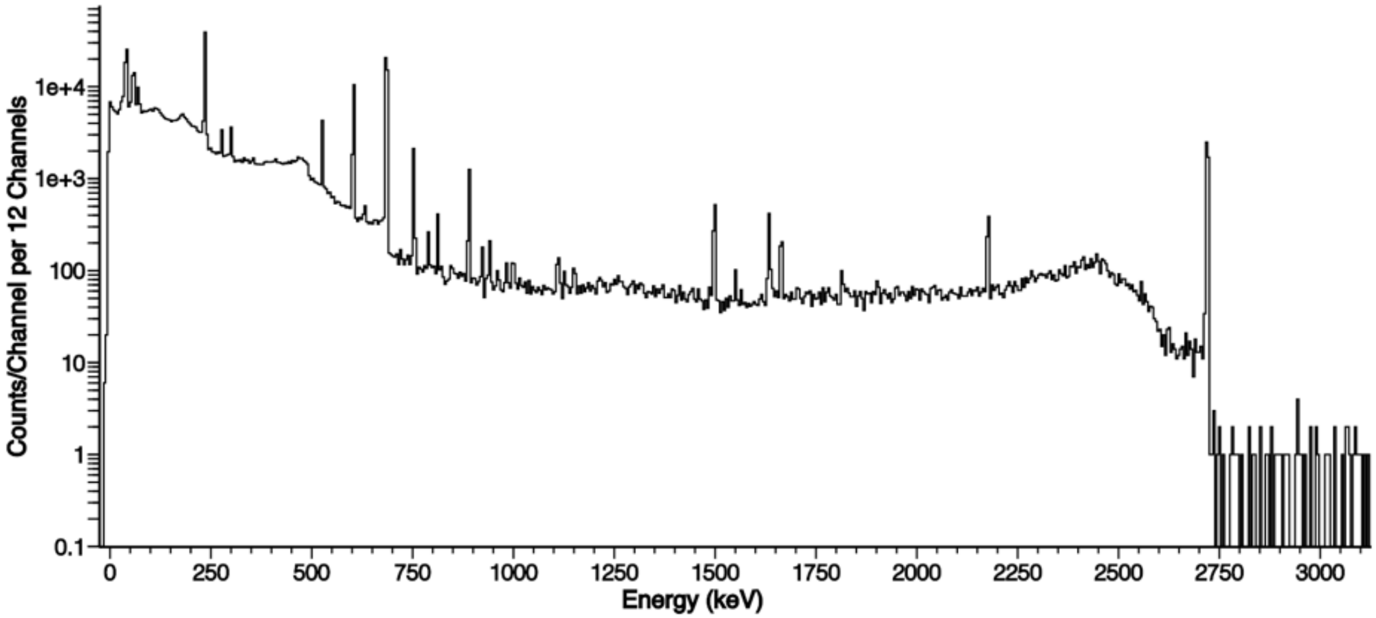
Solution: example3



Truth: 315 uCi of Se75, with 2.54 cm Fe and 2.54 cm Al

Discussion: the HPGe spectra does have some ability to resolve thicknesses for both Fe and Al, although uncertainty on Al is high. NaI spectra is unable to resolve difference between shieldings

deviation_pair_example.n42

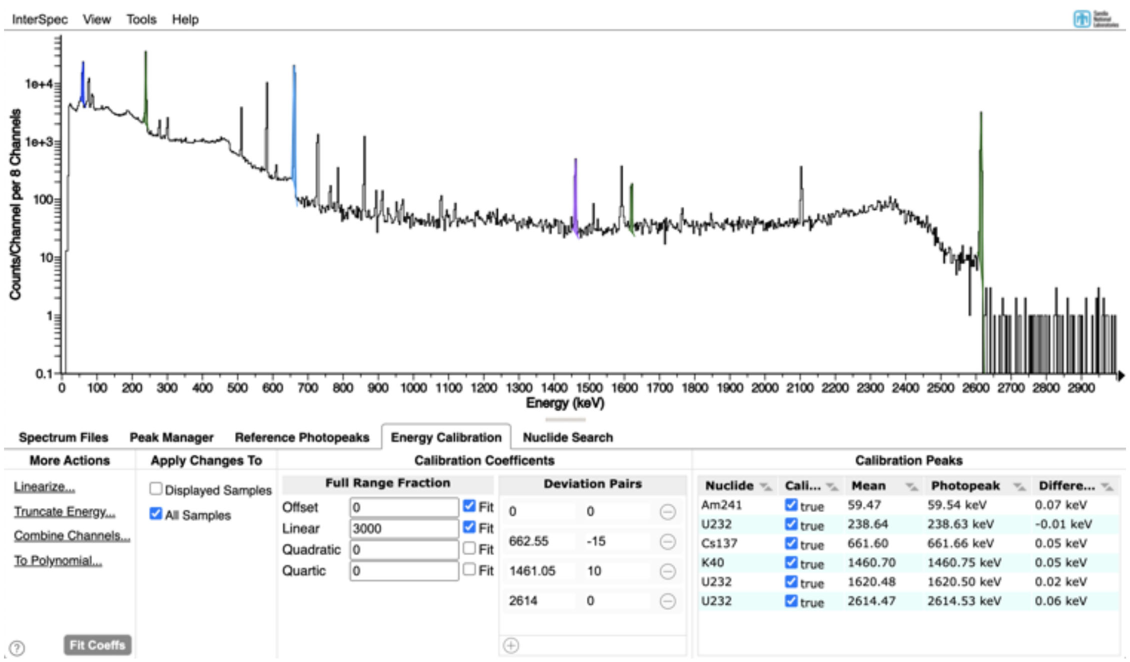


This is a very synthetic example of using non-linear deviation pairs to correct for intrinsic linearities of a detector; deviation pairs are more commonly used in scintillator based detectors.

The spectrum contains unshielded Am241, U232, and Cs137 sources, as well as natural background. Find the offset+linear calibration coefficients and non-linear deviation pairs that work best to produce a calibrated spectrum

- Hint: Use the Am241, Cs137, and K40, and 2614 keV peaks.

Solution: deviation_pair_example.n42



Discussion: adjust offset using 59 keV peak, and gain using 2614 keV. Then add a deviation pair [0,0] and [2614,0], followed by adding deviation pairs for Cs137, and K40. You can either manually edit deviation pairs in the "Energy Calibration" tab, or you can Ctrl+Option+Drag

- This was an artificial example for a quick example