Solution and methods:

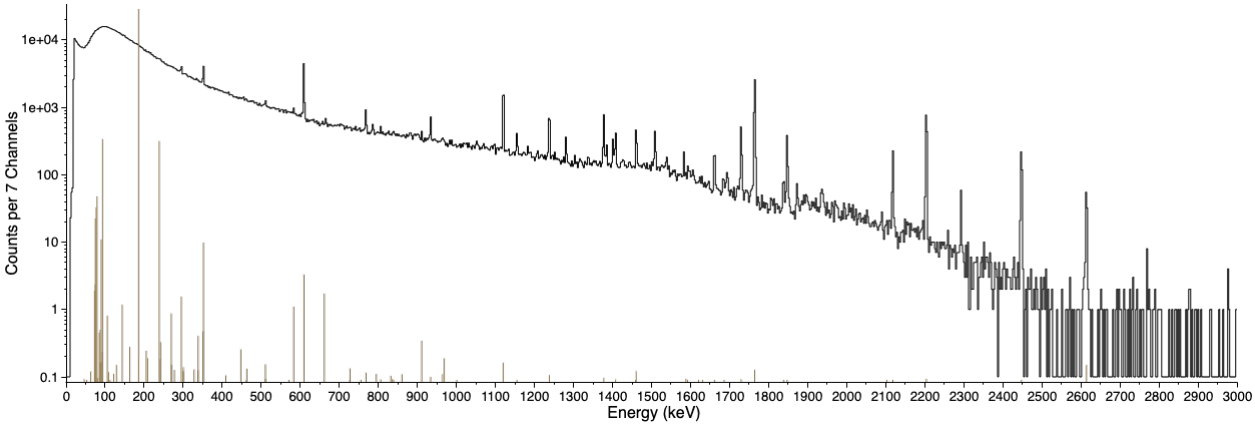

Figure 2 Item of interest shown with ”background” reference lines.

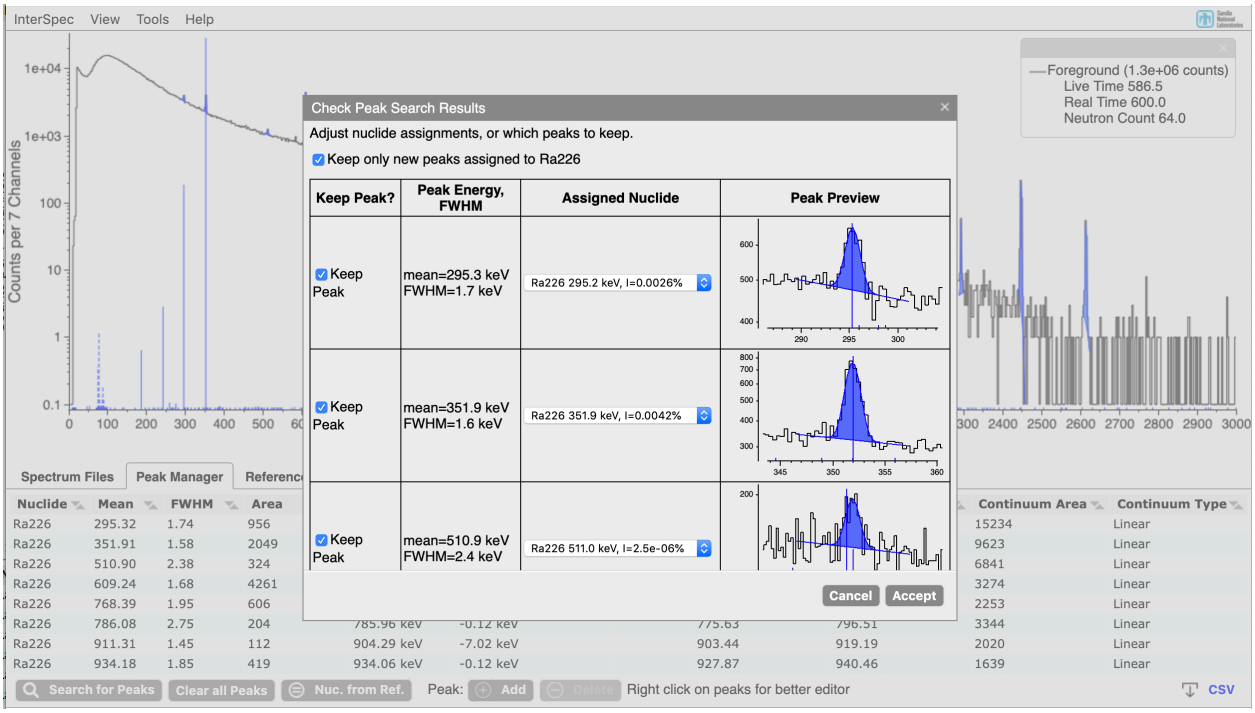

Figure 3 Ra-226 peaks were fit by first displaying the Ra-226 reference lines, and then using the “Search for Peaks” button to automatically fit for peaks. Shown above is the result of the automated search where the option to keep only peaks associated with Ra-226 was selected.

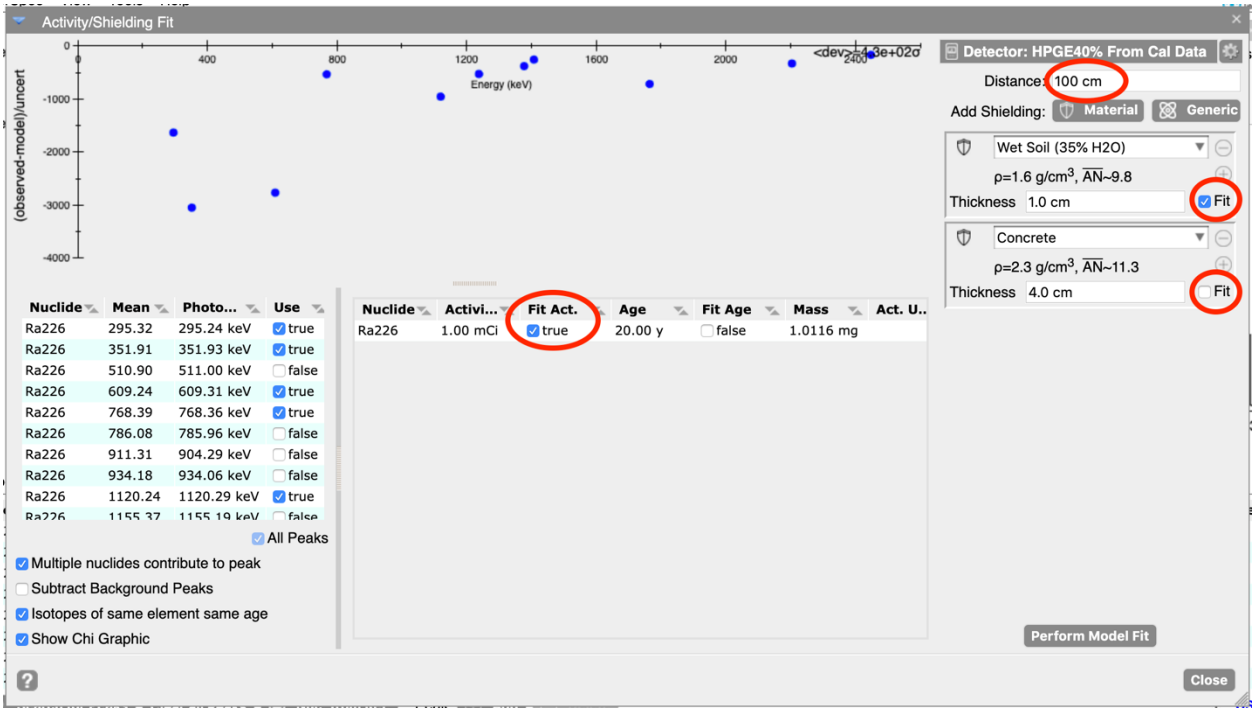

Figure 4 Initial setup of the "Activity/Shielding Fit" tool. An arbitrary distance of 1 m is used, the activity of Ra-226 will be fit for, the concrete thickness is fixed at 4 cm, and the thickness of the soil will be allowed to vary.

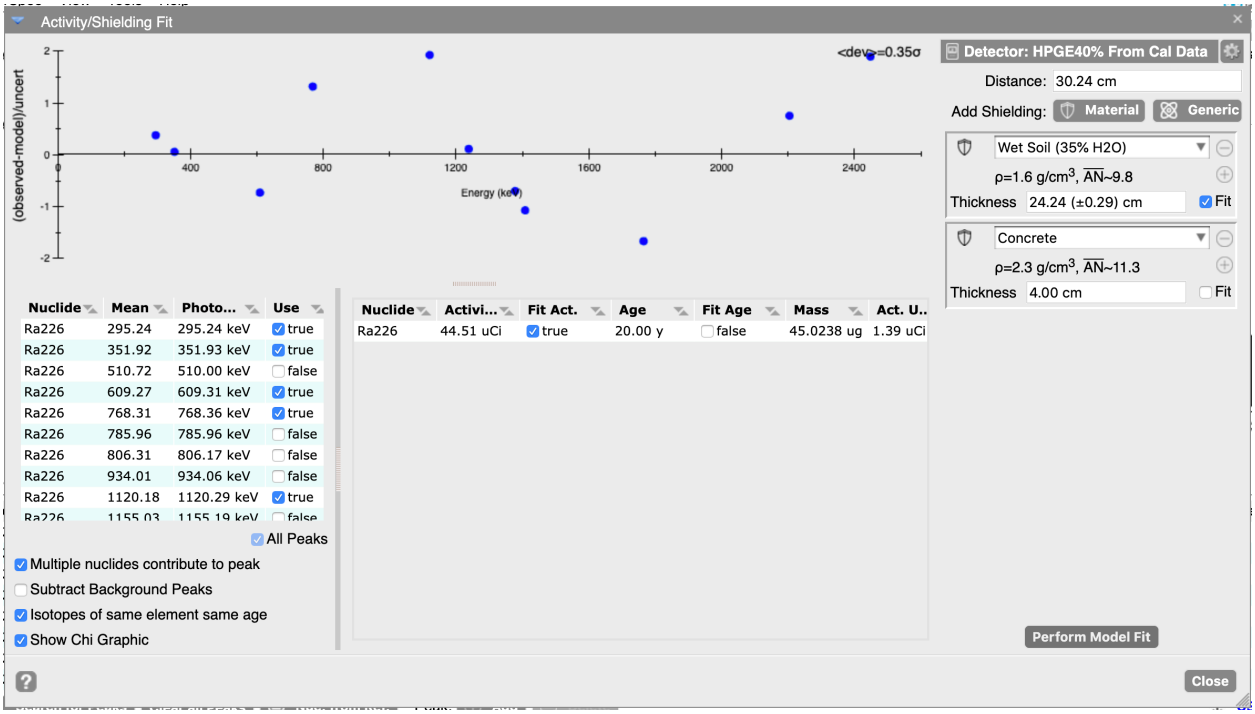

Figure 5 Final fit results.

a) Although all lines in the spectrum are lines expected from background, the Ra-226 lines are proportionally much larger than would be expected relative to Th-232, K-40, or other background lines. Figure 2 shows "background" reference lines in InterSpec where you can determine that Ra226 is at least 10 times or more than the nominally expected background amplitudes.
b) The Ra-226 lines were fit by first displaying the Ra-226 reference lines, then using the "Search for Peaks" button to automatically search for the peaks; the option to only save the peaks from Ra-226 was selected, as can be seen in Figure 3.
   Then from the "Activity/Shielding Fit" tool, an arbitrarily large distance (1 meter) was chosen, with the soil thickness fit for, the Ra-226 activity fit for, and the concrete thickness fixed at 4 cm, as shown in Figure 4. InterSpec's recommendation for which peaks to use in the fit was taken with no modification, although similar results will be found if all peaks besides the 511 keV peak is used.
   The fit then determined the soil was 24.24±0.29 cm thick from the relative attenuation of the soil.
   Truth-level answer: the source is under 25 cm of soil.
c) The fit soil thickness of 24.24 cm was added to the 4 cm of concrete thickness, and the 2 cm the detector face was off the ground, to get a total distance of 30.24 cm. The distance in the tool was set to this, and an activity of 44.51 uCi was fit for, as shown in Figure 5.
   Truth-level answer: 50 uCi of Ra-226.