NSDD
NUCLEAR SMUGGLING DETECTION AND DETERRENCE

NSDD Flavor Drill May 2026

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Title: NSDD Flavor Drill May 2026
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Introduction

This is the NSDD "Flavor of the Month" drill for May 2026.

This exercise concerns sources used in the oil extraction industry. Questions 1–7 concern spectra collected with a RadSeeker detector equipped with a 3.8 cm × 3.8 cm LaBr3 scintillation crystal. Questions 8–10 concern spectra collected with a high-purity germanium (HPGe) Detective-X detector.

This exercise first appeared as a pilot drill with limited distribution in July 2020. It is reproduced here for full distribution. The estimated difficulty level is 7 out of 10.

Case A:

Consider the spectrum *Case_A_Petro.N42*.

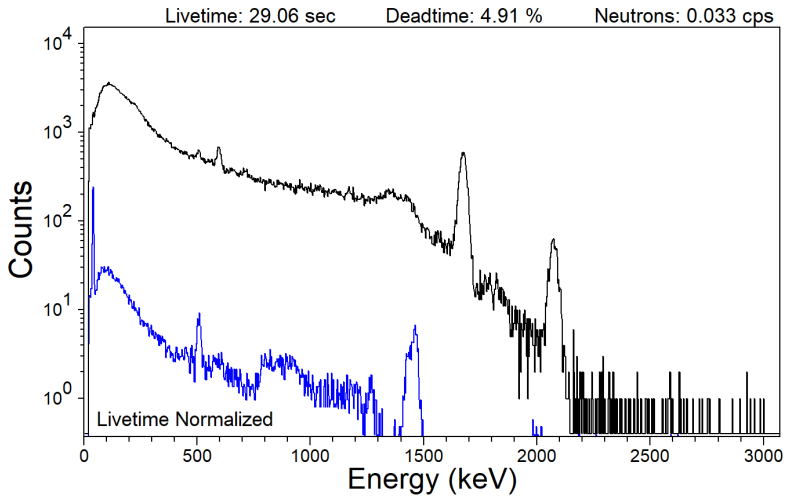
This file contains three spectra:

- Spectrum 1/3: Item of Interest
- Spectrum 2/3: Na-22 stabilization source, background subtraction applied
- Spectrum 3/3: Background. Note that LaBr3-based detectors contain intrinsic radioactivity.

If your software cannot process an N42 multi-spectrum file, these spectra are available separately in the "Additional Formats" folder.

Note: If you are using InterSpec then the order of spectra within the N42 file may be different. In version 1.0.14, Spectrum 1/3 is the Na-22 stabilization source, 2/3 is the Background, and 3/3 is the Item of Interest.

To select an individual spectrum in InterSpec, click the **Spectrum Files** tab and use the arrows in the **Foreground** box to choose spectrum 1/3, 2/3, or 3/3 as shown below. You may also hide the background by clicking the "x" in the **Background** box.



Question 1: Is a gain shift evident?

Consider the 511.0 keV positron annihilation peak in either the Na-22 spectrum or the background spectrum.

☐ Yes. A gain shift is evident.

☐ No gain shift. This peak appears at 511.0 keV as expected.

Question 2: Is the peak near 1460 keV in the background spectrum suitable for energy calibration?

Select **one** answer.

☐ Yes. This is the 1460.8 keV peak from K-40
☐ No. This peak contains contributions from both K-40 and La-138 in a LaBr3-based detector
☐ Yes. The K-40 and La-138 contributions can be separated in this case

Question 3: What radionuclide is present in the Case A Item of Interest?

Select **one** answer.

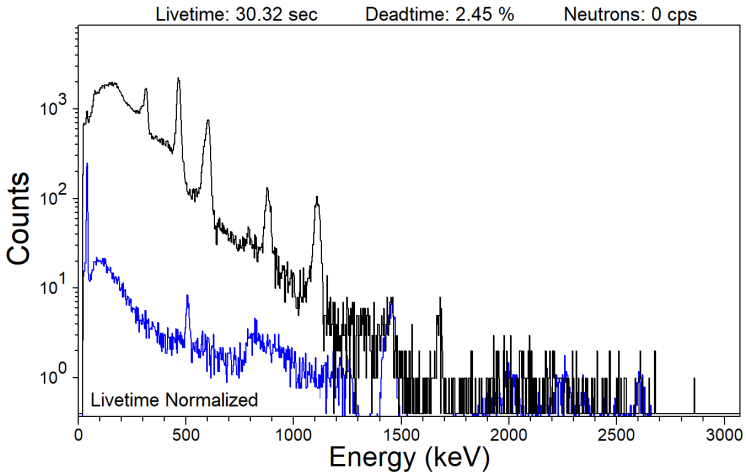
☐ As-74
☐ Ge-77m
☐ I-124
☐ Lu-169
☐ Sb-124
☐ Te-119m

Case B:

Consider the spectrum *Case_B_Petro.N42.*

As in before, this file contains three spectra:

- Spectrum 1/3: Item of Interest
- Spectrum 2/3: Na-22 stabilization source
- Spectrum 3/3: Background



Question 4: Which two radionuclides are most prominent in the Case B Item of Interest spectrum?

Select **two** answers.

☐ Bi-206
☐ Ce-143
☐ Cr-48
☐ Ir-192
☐ Sc-46
☐ Te-129

Question 5: Is it plausible that the radionuclide identified in Case A is also present in Case B?

☐ Yes
☐ No

Question 6: Is there any evidence to suggest the presence of U-235, Pu-239, or Np-237 in either Case A or Case B?

Select **one** answer.

☐ Yes, U-235
☐ Yes, Pu-239

☐ Yes, Np-237
☐ No

Question 7: Is there evidence of shielding in either Case A or Case B?

The spectra were collected during a real cargo detection event. The shielding material and thickness are unknown.

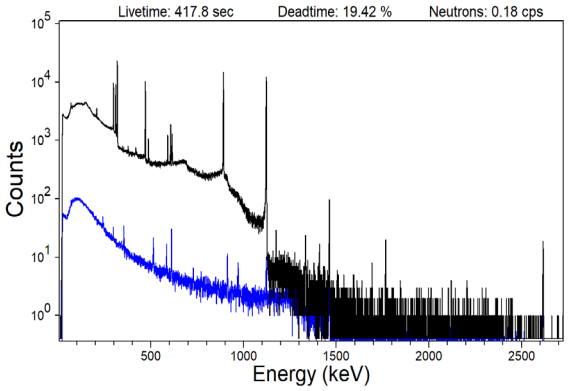
Select **one** answer.

☐ Yes, distinct x-ray lines from shielding materials are visible
☐ Yes, the lower-energy peaks appear attenuated relative to the higher-energy peaks.
☐ No, I do not observe any indications of shielding.

Case C:

Consider the spectrum *Case_C_Petro.SPE.*

A distributed radioactive source was found near a roadway in an oil extraction region. The source is likely discarded radioactive tracer material. The spectrum was collected using a high-purity germanium (HPGe) Detective-X detector. A corresponding background spectrum, *Case_C_Background.SPE*, was collected nearby.



Question 8: Is the radionuclide identified in Case A also visible in Case C?

☐ Yes
☐ No
☐ Indeterminate

Question 9: Are the two radionuclides identified in Case B also visible in Case C?

Select **one** answer.

☐ Yes, both radionuclides are visible.
☐ Only one of the two radionuclides is visible.
☐ No, neither of the two radionuclides is visible.

Question 10: What additional radionuclide is visible in Case C?

Select **one** answer.

☐ Au-198
☐ Br-82
☐ Co-60
☐ H-3
☐ I-131
☐ Kr-85
☐ Na-24
☐ P-32
☐ Tc-99m