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DOE Triage& Field Techniques

Bryon P Marsh

February 2019

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Idaho National Laboratory
Idaho Falls, Idaho 83415

http://www.inl.gov

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DOE TRIAGE & Field Techniques for Spectrum Collection

Advanced Radiological Detection Training
WMD-Civil Support Team, 2019

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Idaho National Laboratory

U.S. DEPARTMENT OF ENERGY
NNSA

Objectives

- Review priorities for the end-user (DOE TRIAGE)
- Discuss options for instrument setup
- Review general techniques for collecting field spectra
- Identify variations and how to adapt to non-routine situations
- Review case studies from previous responses

When to Use DOE TRIAGE

- Radioisotope Identification (RIID) has identified SNM or weapon material
- Radionuclides don't make sense or require clarification
- Inconclusive report (unknown peak, not in library)
- Neutrons unexpectedly detected
- Providing a hazard assessment to the FBI for TCE
- Some Special Security Events may require all spectra to be submitted to TRIAGE for review and archiving
- Any other reason to think the situation requires further analysis

What Triage Needs

- A GOOD 300 sec. spectrum of the Item of Interest, on location of the highest activity or radiation reading
  - Consider dead-time or dose rate limits
- A representative 300 sec spectrum of the local background
- A spectrum of a known source
- Type / make / model of detector
- Distance from detector to the item of interest
- Description of shielding (intervening materials)
- Were there neutrons present?
- Two dose (or count) rates at two different distances
- Pictures !!!!!

What DOE Triage Provides

- 24/7 on-call support to first-response teams
- Specializes in interpretation of spectra analysis
- Typical response begins within 10 minutes
- Typical answer in 30-60 minutes
- Minimize cost of false/innocent alarms with accurate ID
- Consensus report from experienced scientists LANL, LLNL, and/or SNL (two on call)

Pre-Operational Setup

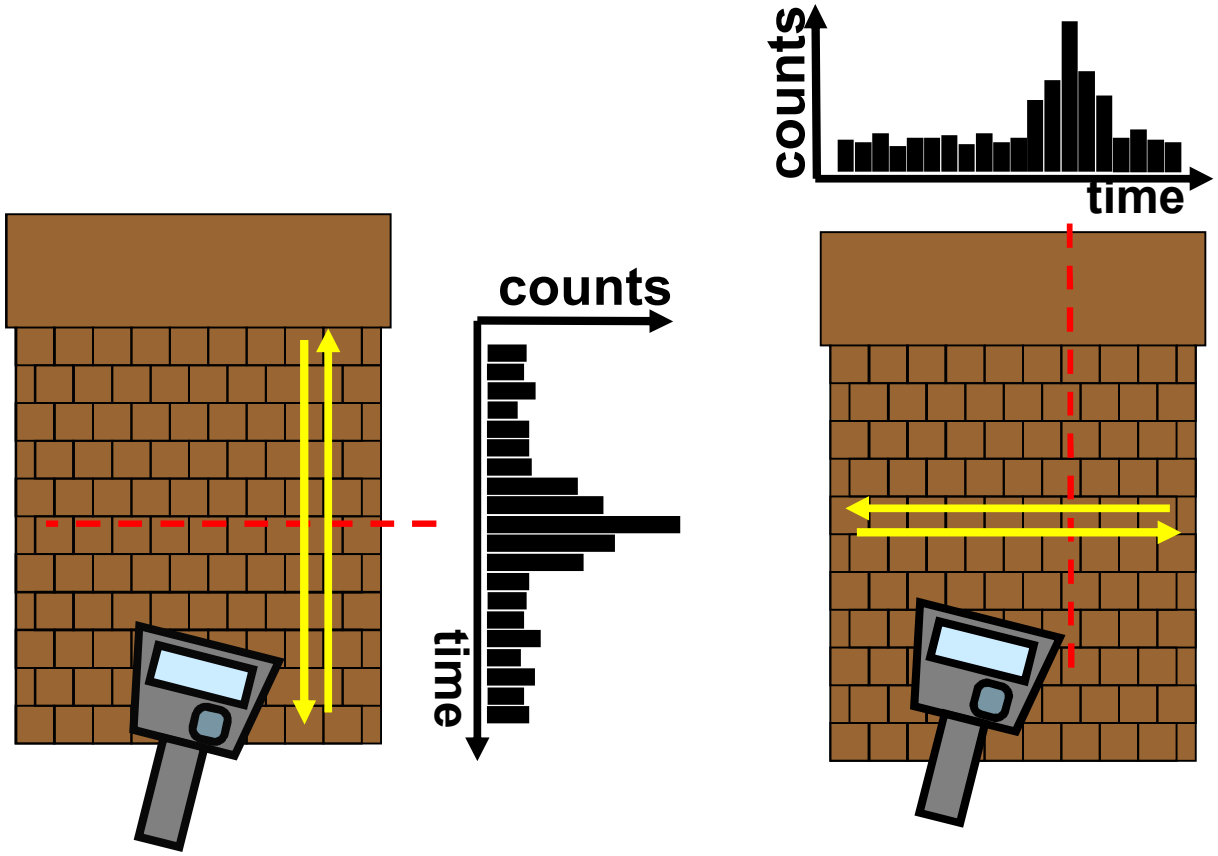
- Develop instrument checklists to get everyone on the same starting page

- Take care of the maintenance items
  - Date/time
  - Clear old spectrum files
  - Clear the alarm log file
  - Do the energy calibration and intrinsic background

- Verify parameter settings

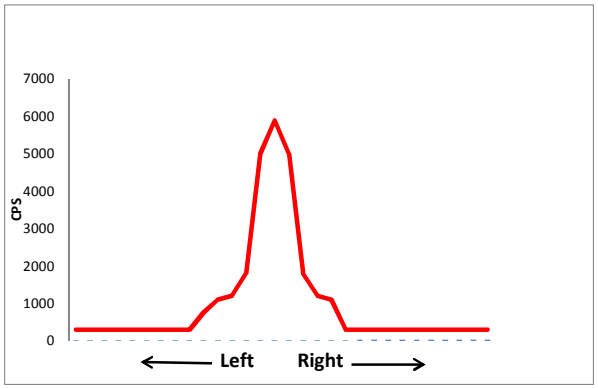
Step-1: Locate the Hotspot

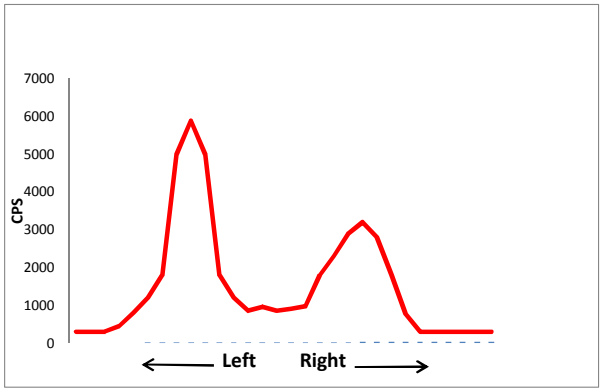
- Search T method

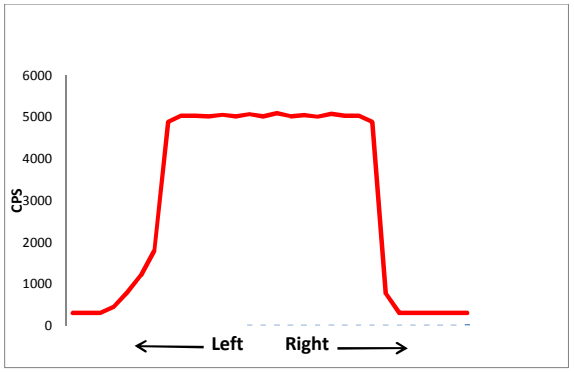


Finding the Hotspot (cont.)

- Find the hotspot on the surface of the container







Is it a single point source?

Is there multiple point sources?

Does the radioactivity appear to be distributed?

Step-2: Obtain a Quality Spectrum From Object

- Use your best detector (resolution)
- Take with no calibration sources nearby
- Use the same instrument for collecting background and known spectrum
- Collect initial spectrum for 300 sec
- Consider collecting additional long count time spectrum (10-30 min) with a Detective to send later

Obtain a Quality Spectrum From Object (Cont.)

- Place detector in the same plane as the located hotspot and then move detector farther away or closer to optimize the measurement:
  - IdentiFinder = within the goal posts
  - Detective = < 20% dead time or < 10,000 cps

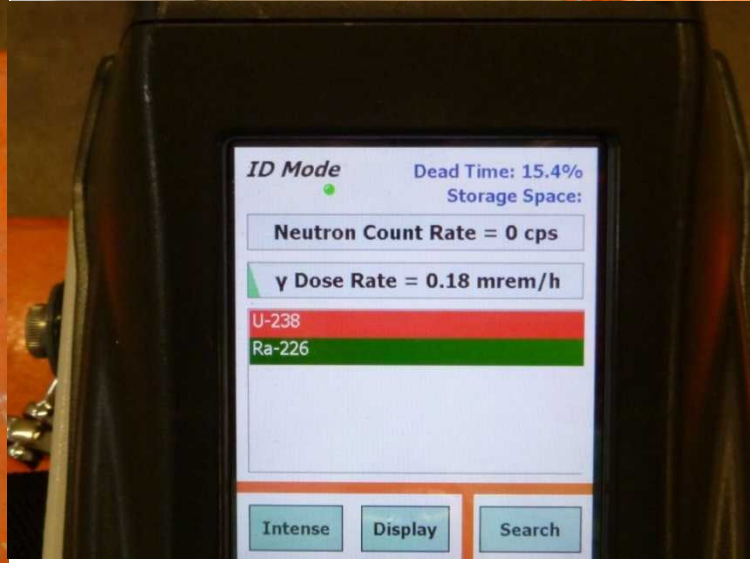
Step-3: Take Pictures of the Measurement Process

- Picture from the side view of the detector / source setup

- A wide area view to help the Triage analyst understand the situation

Take Pictures of the Measurement Process (Cont.)

- Document measured dose rates and distances
- Initial nuclide identification
- Any markings, labels or information about the container



Step-4: Record the detector distance from source

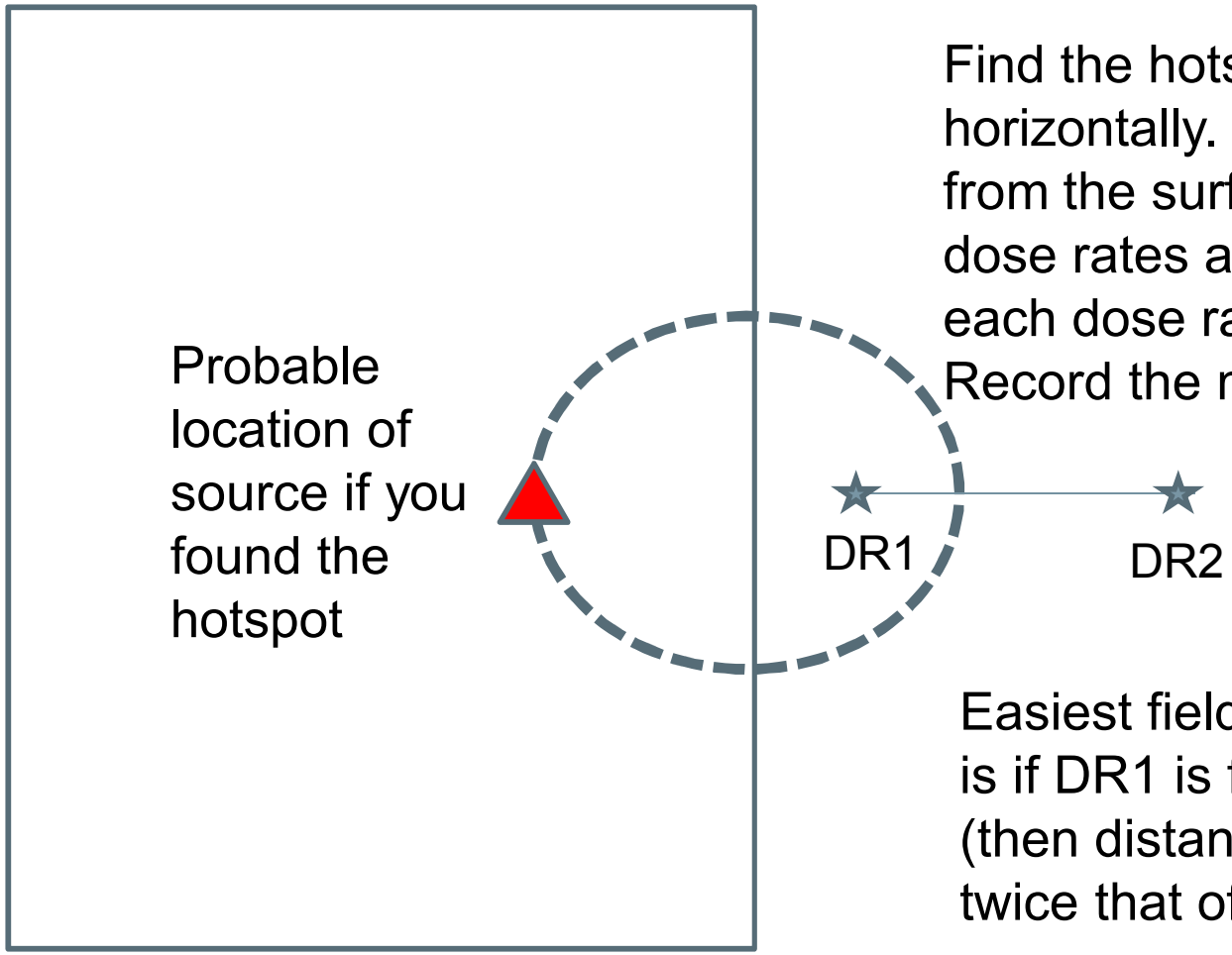
- For small objects/containers measure to the center
- For large containers measure to the skin (surface)

Step-5:Obtain Two Dose Rate Measurements at Different Distances

First dose rate measurement can be at the same distance that the spectrum was collected

Second dose rate measurements can be made by backing away or moving closer until the dose rate is 1/4th or 4 times higher than the first measurement

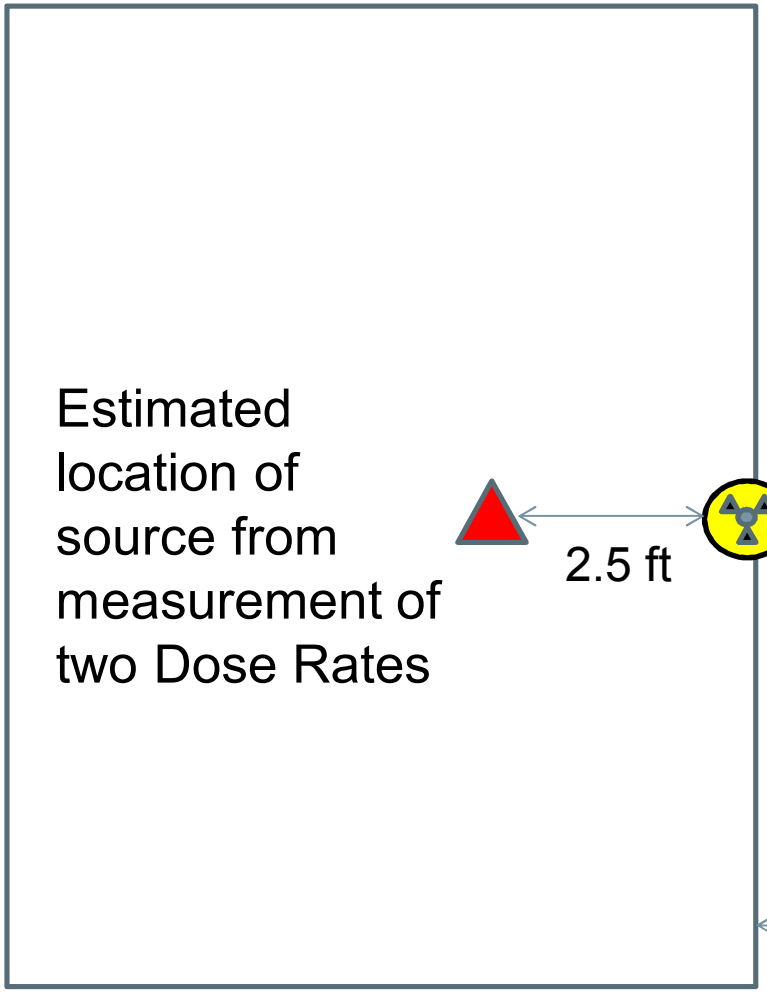
Distance and Dose Rate



Find the hotspot vertically and horizontally. Coming straight out from the surface, measure two dose rates and the distance for each dose rate.
Record the measurements

Easiest field determination is if DR1 is four times DR2 (then distance at DR2 is twice that of DR1).

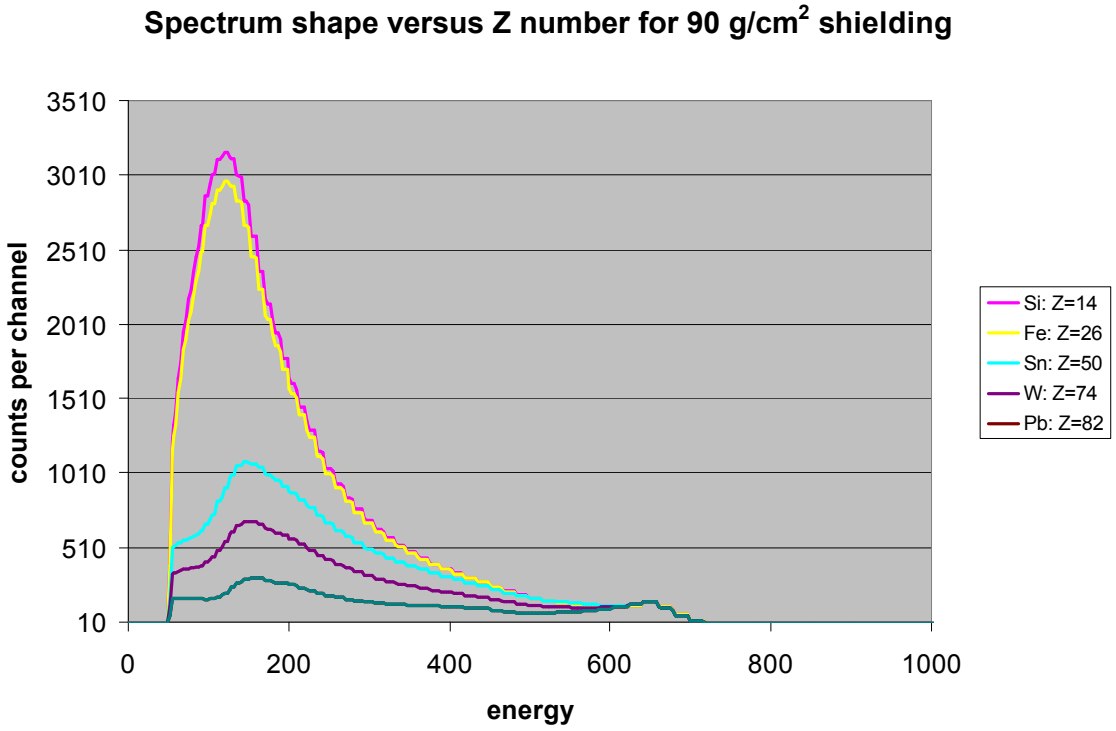
Report Accurate Distances



If the reported distance is “2 feet” because your distance from the detector to the container is 2 feet, that doesn’t tell the true distance if the detector is on the ground, 6 feet below the hotspot, and the hotspot is estimated to be 2 and a half feet from the estimated source position.

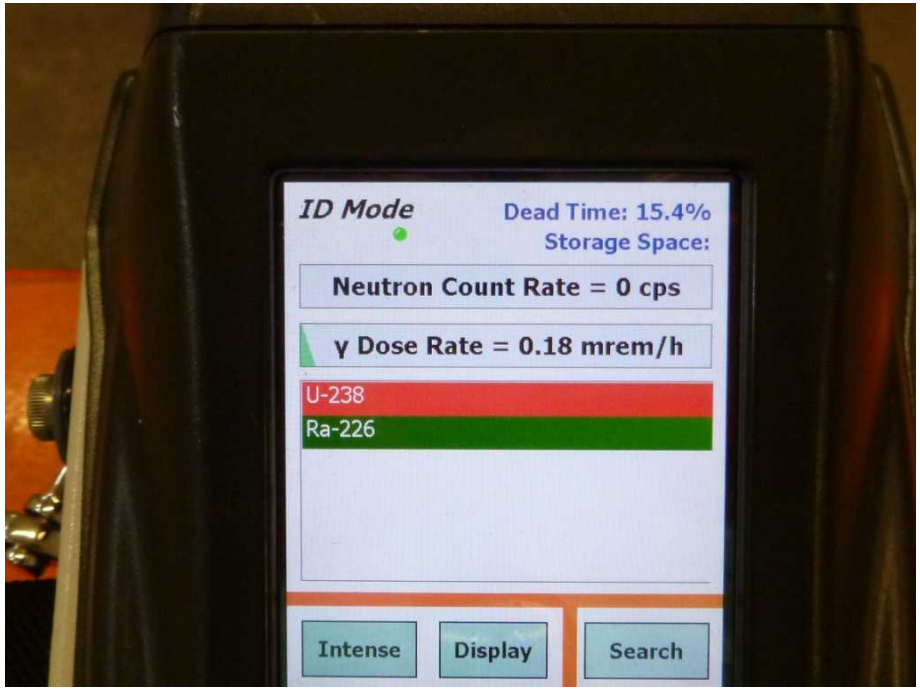
Step-6: Identify Intervening (Shielding) Materials

- If you know what intervening materials are, note it.
- Otherwise, describe what it appears to be



Step-7: Record Instrument and Measurement Data

- Dose Rate @ 2 distances
- Neutron Counts
- Isotope (S) ID
- Intervening Materials

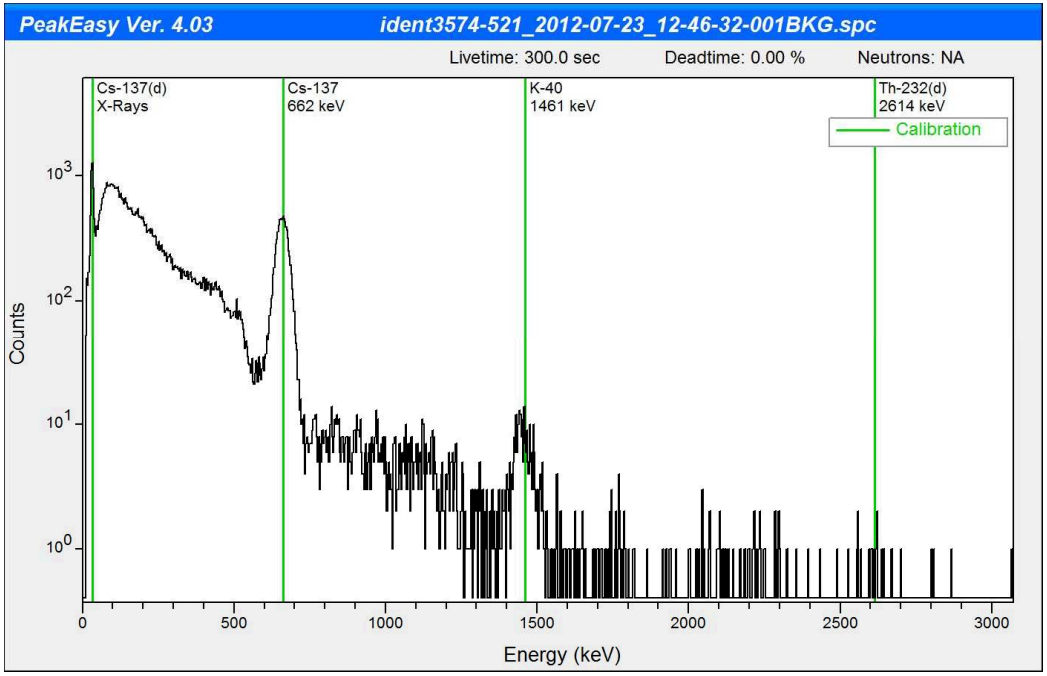


Step-8: Collect Representative Background

- Take a spectrum in same environment, near as possible to location of item of interest but at background dose rate/gamma cps
- Collect data for the same length of time (longer is okay) as item of interest spectrum
- Can be collected before or after the item of interest spectrum but must be representative (same environment)
- Use the same instrument as item of interest spectrum

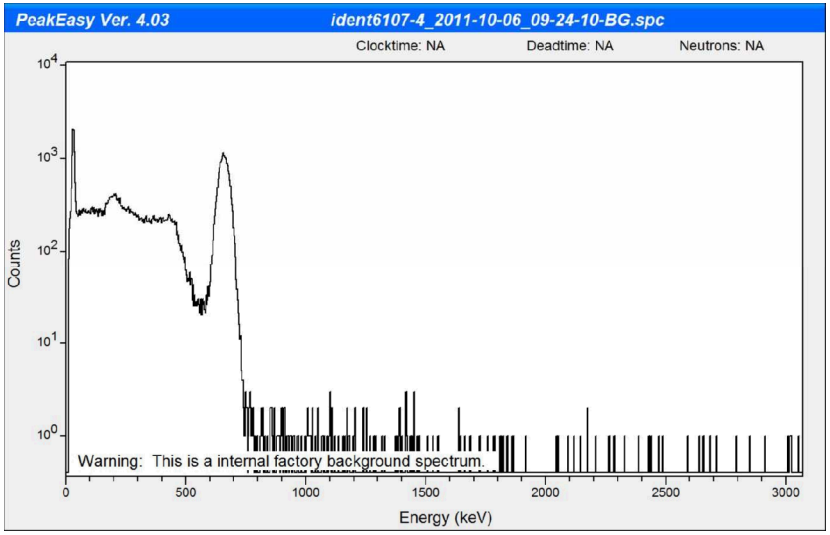
Collecting a Representative Background Spectra

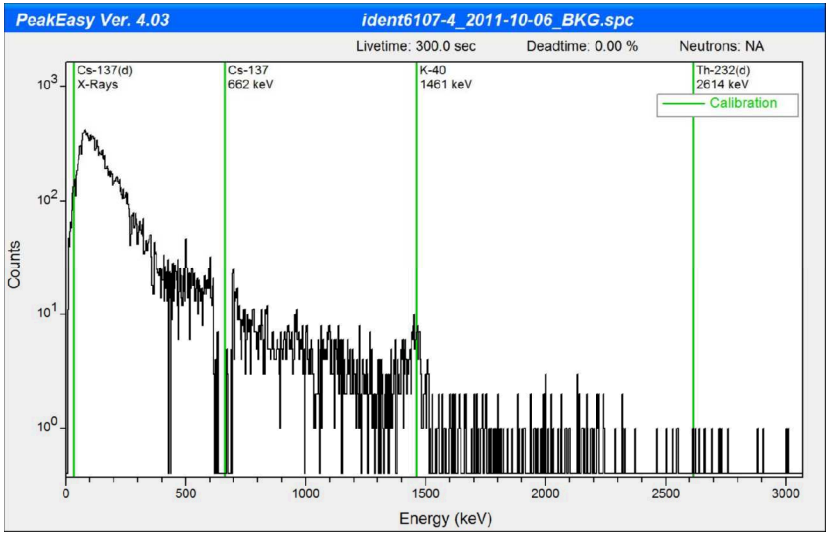
- IdentiFinder may have Internal Cs-137 source
- Should see peaks for K-40 and Th-232 (TI-201)
- Collect at least for the same time period as item of interest



IdentiFinder Internal Background Subtraction

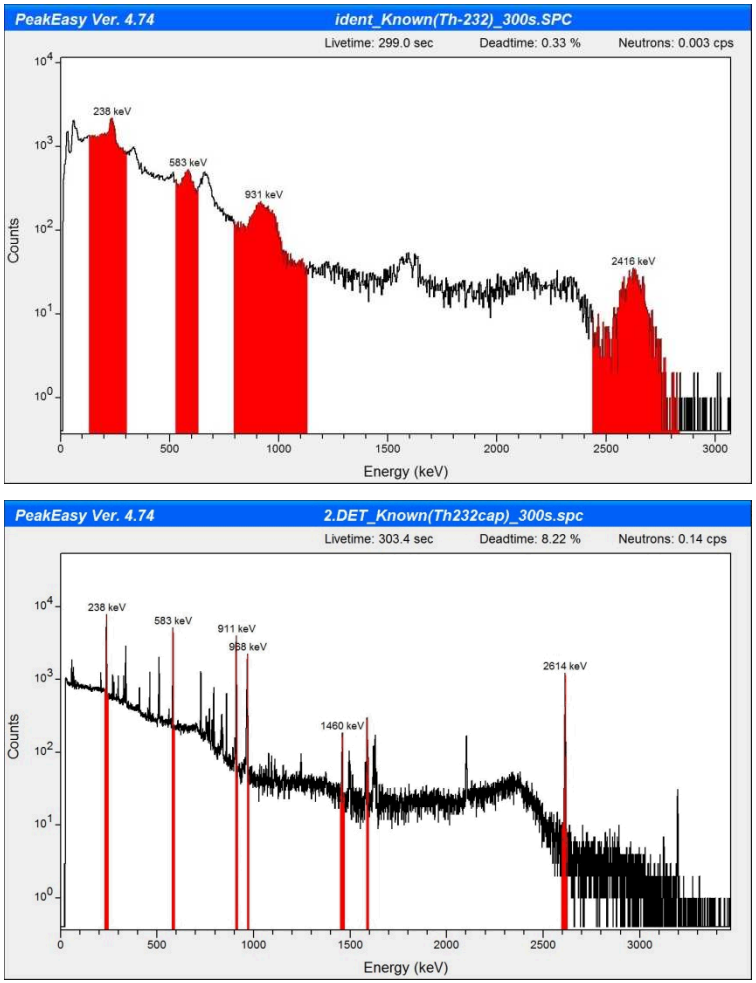
- Internal background file is a factory default and not representative of field measurements
- Be sure that the background subtract option is disabled on the IdentiFinder
- Reanalyze spectrum on the IdentiFinder as needed to correct for auto-subtraction





Step-9: Collect a Known Spectrum

- Used to verify energy calibration and QA/QC of the RIID
- Can be collected anywhere but should be collected in the same operational period as item of interest
- Best to use a multi-energy (Th-232) source
- Same collection time as background and unknown
- If using a check source, record the dose-rate, distance and activity



Step-10: Process Spectrum Files & Pictures

- Store original spectra files and pictures in an event folder
- Create new sub-folder called Triage and change spectra file names

Original File Name	Triage File Name
ident3574-1060_2010-05-17_14-09-02-000.spc	Ident3574-1060_Bkg_10min.spc
ident3574-1060_2010-05-17_14-09-02-001.spc	Ident3574-1060_Known_(Th232)_5min.spc
ident3574-1060_2010-05-17_15-13-45-007.spc	Ident3574-1060_Unknow_5min.spc

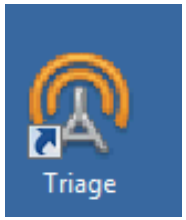
- In the new file name include; spectrum type, count-time, and isotope for the known

Process Spectrum Files & Pictures (Cont.)

- Compress photos if needed for submittal to Triage
- Consult the Triage Guide for help with processing spectra and pictures
  - Triage_Checklist.doc
  - RAP6_TRI.02.P

Step-11: Activate DOE Triage

- DOE Triage Website: **https://triage-data.net/**
- Triage Thick Client –software utility program (not currently used on DoD networks)
- Email:



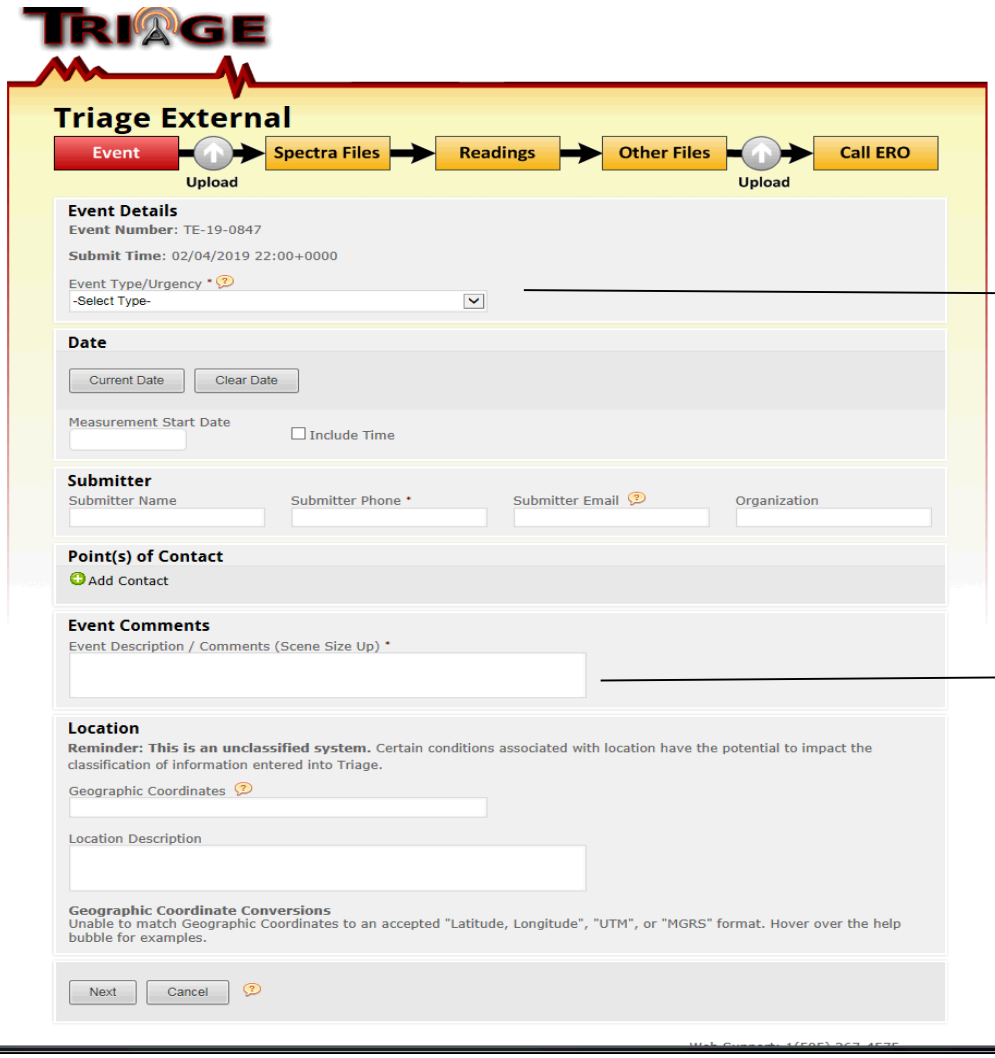
triage.data@hq.doe.gov

triage.data@LANL.gov

triage.data@LLNL.gov

- **DOE 24-hour Watch Officer: (202) 586-8100**

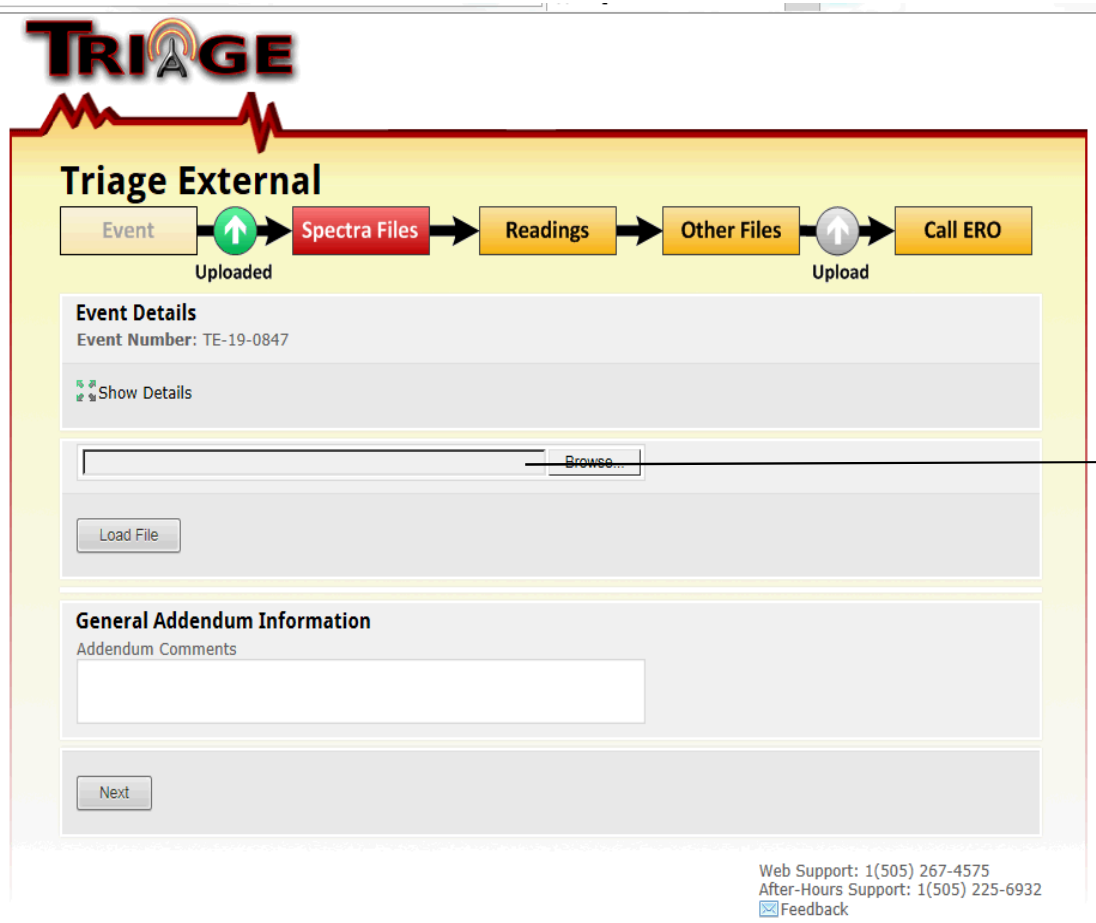
Triage submission form



Comms test
No
response

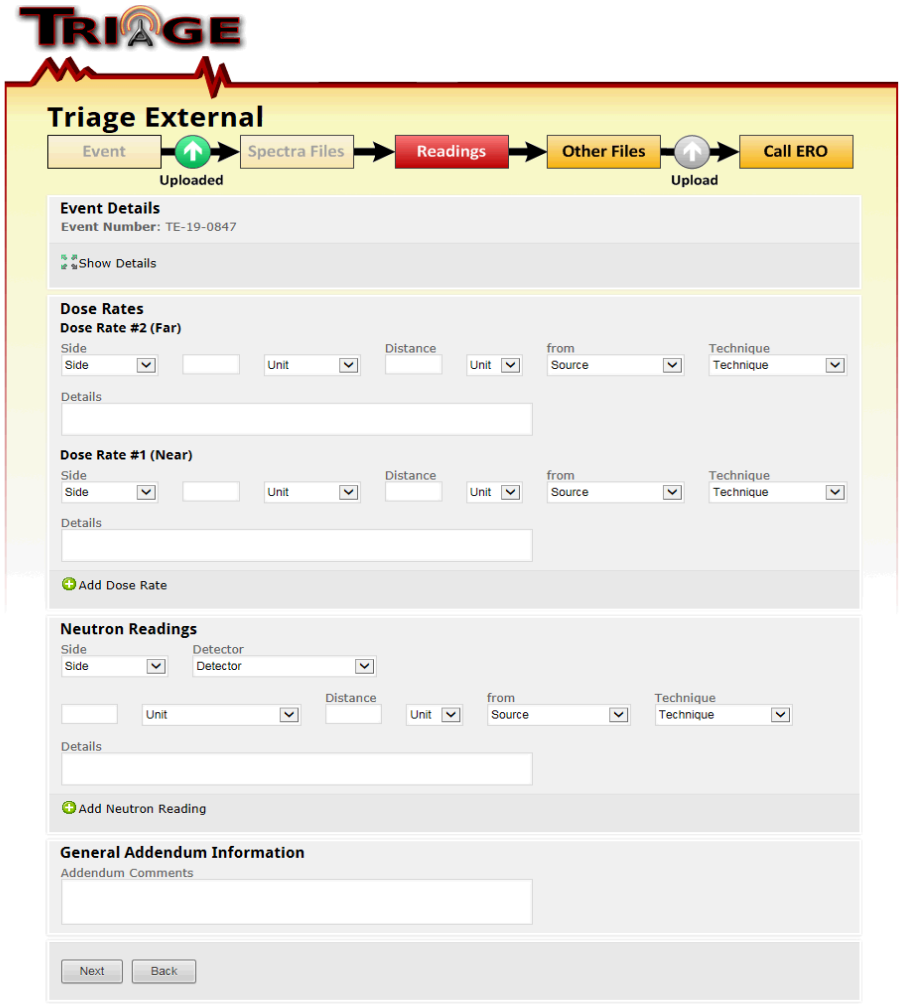
Exercise at INL

Triage submission



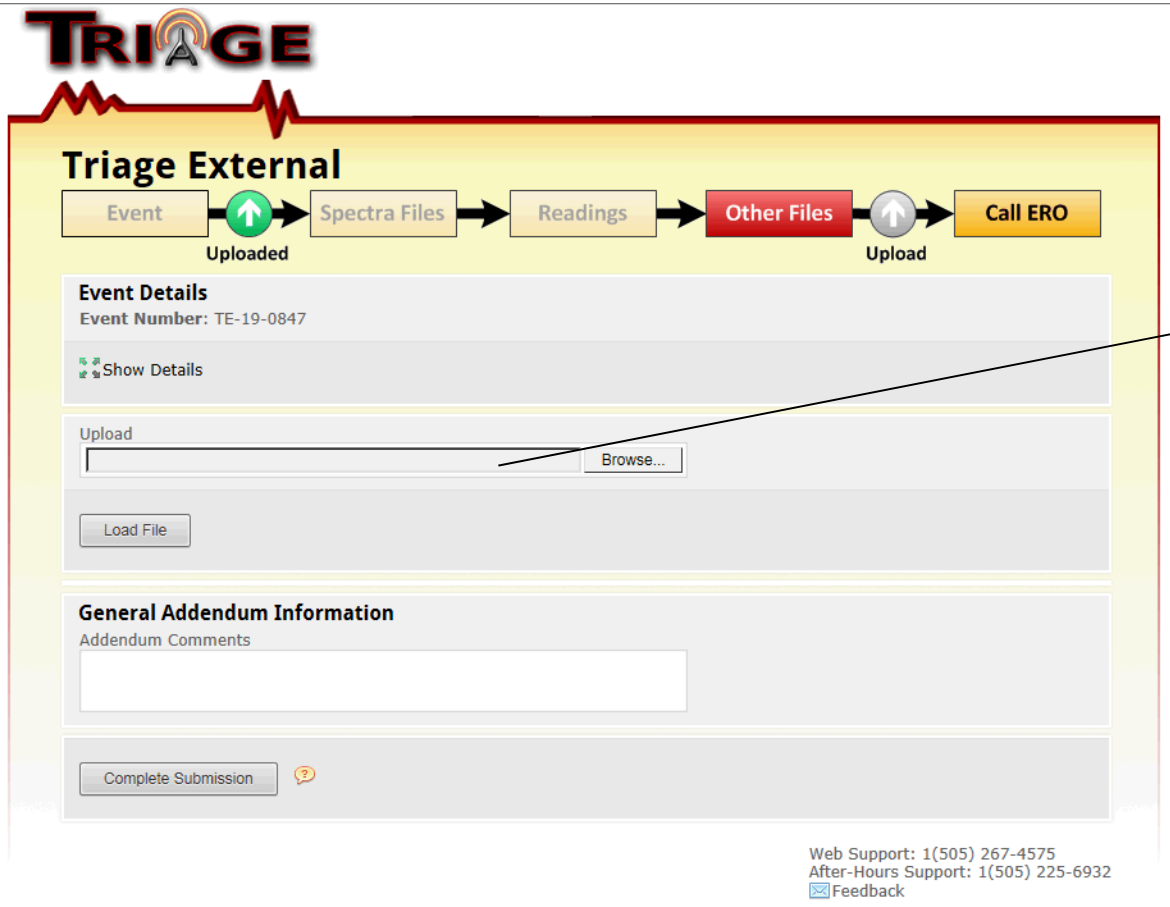
Load files from desktop folder .N42 are best

Triage submission



Dropdown menus should be used for every data item .
Details box should describe instrument used and any other pertinent details

Triage submission



Upload pictures with good descriptive file names

Questions ????