Radiological TRIAGE
U.S. Department of Energy

C:\Triage\Drill 63\Drill #63 unknown.chn,

live-time = 43.5
chi-square = 2.0

Energy (keV)

Counts / keV

10^{-1}
10^{1}
10^{2}
10^{3}

500 1000 1500 2000 2500

Energy (keV)
What is Radiological TRIAGE?

Radiological TRIAGE is 24/7 on-call support to first responder teams for analysis of nuclear data (especially gamma-ray spectra) and includes:

- Acknowledgement of request within 10 minutes and an answer in 30-60 minutes
- Ready access to a cadre of nuclear scientists
- Independent laboratory assessment by two nuclear scientists using different advanced spectroscopy analysis tools
- Scientific review of analysis via telephone conference call

Radiological TRIAGE helps prevent an unnecessary full-scale response when there is no threat, or can “pull the fire alarm” if the threat appears to be serious.
Origin of TRIAGE

- Jan 2002
  - Toy soldiers found containing powder, early results suggest highly-enriched uranium

- Scientists from three National Laboratories reviewed the data:
  - Analysis indicated depleted uranium (0.25±0.05%) $^{235}$U; low threat

- Triage program begins
  - Nuclear expertise available on short notice
Radioisotope Identification

High Resolution versus Low Resolution Gamma Spectroscopy

“ability to resolve adjacent gamma peaks”

Comparison of a sodium iodide spectrum (low resolution) to a high purity germanium spectrum (high resolution)
Triage supports a wide array of radioisotope identification instrument file formats and routinely evaluates new instruments.
Identification Problems

Many of the commonly used low resolution identification instruments often give incorrect or incomplete analysis.

Examples include:

False Positives - incorrectly reporting a threat where none really exists

False Negatives – incorrectly not reporting a threat when there is one

No answer or ambiguous answer, e.g., “not in library,” or “unidentified peak”

Operator inexperience such as low count rates or high dead times

15 models tested, 1827 results
Worldwide TRIAGE Events
Under the direction of the DOE Office of Emergency Response, the TRIAGE Team consists of:

- DOE Emergency Operation Center in Washington, D.C.
- DOE On-Call Emergency Response Officer
- Nuclear scientists from:
  - Los Alamos National Laboratory
  - Lawrence Livermore National Laboratory
  - Sandia National Laboratory
What does TRIAGE provide?

The TRIAGE assessment provides:

- Radionuclide identification using advanced spectral analysis tools
- Review for the presence special nuclear materials
- Isotopic analysis of special nuclear materials identified
- Estimate of the amount of radioactivity
- Analysis of neutron data
- Shielding materials
- Potential risk
1. Call DOE Emergency Operations Center (EOC) at +1-202-586-8100 and request TRIAGE support.

   Provide the name and phone number of a contact person.

2. The EOC will advise on the method of submitting the data either by email or the TRIAGE web site.
What to provide a TRIAGE request

Type of detector (make/model)
Isotopes identified
Distance to source
Data collection time (at least 300 seconds)
Description of unknown
Any shielding
Neutron count rate data
Spectral files – unknown, background, calibration
Photographs – detector and suspicious package
First Responder Example

Scenario

During a pre-event radiological search, a team locates a suspicious wooden box. Measurements with a radiation pager give low level readings. A gamma spectrum with a Radioisotope Identifier is acquired for analysis.
High Resolution vs Low Resolution

Gamma-ray spectra

Comparison of a sodium iodide spectrum (low resolution) to a high purity germanium spectrum (high resolution)
Spectrum for TRIAGE

Low resolution spectrum from radioisotope identifier
<table>
<thead>
<tr>
<th>What to provide a TRIAGE request</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of detector</strong></td>
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<tr>
<td><strong>Isotopes identified</strong></td>
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<td><strong>Spectral files</strong></td>
</tr>
<tr>
<td><strong>Photographs</strong></td>
</tr>
</tbody>
</table>
TRIAGE Website

https://triage-data.net
TRIAGE Website

Disclaimer

This is a Federal computer system and is the property of the United States Government. It is for authorized use only. **Users** (authorized or unauthorized) have no explicit or implicit expectation of privacy.

Any or all uses of this system and all files on this system may be intercepted, monitored, recorded, copied, audited, inspected, and disclosed to authorized site, Department of Energy, and law enforcement personnel, as well as authorized officials of other agencies, both domestic and foreign. By using this system, the user consents to such interception, monitoring, recording, copying, auditing, inspection, and disclosure at the discretion of authorized site or Department of Energy personnel.

Unauthorized or improper use of this system may result in administrative disciplinary action and civil and criminal penalties. By continuing to use this system you indicate your awareness of and consent to these terms and conditions of use. **LOG OFF IMMEDIATELY** if you do not agree to the conditions stated in this warning.

Accept | Decline

This site is approved for unclassified information. **THIS WEB SITE MAY NOT BE USED FOR CLASSIFIED INFORMATION OF ANY KIND.** Please contact the ERO at 202-586-8100 if you have any questions regarding classification.
TRIAGE Website

Reminder

You must contact the NA42 Emergency Response Officer (ERO) to activate triage after submitting an event or addendum.
You may also contact the ERO if you need additional guidance or assistance at any time.

202-586-8100 (24/7)

Actions

- Enter Event
- Enter Addendum
- Triage Documents
### Event Details

<table>
<thead>
<tr>
<th>Event Number</th>
<th>TE-13-1155</th>
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<tbody>
<tr>
<td>Submit Time</td>
<td>03/30/2013 19:41+3000</td>
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<tr>
<td>Event Type</td>
<td>Drill</td>
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<tr>
<td>Evaluation</td>
<td>No Response</td>
</tr>
<tr>
<td>Urgency</td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>DOE</td>
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</table>

#### Measurement Start
- Date: 03/30/2013
- Current Date: 
- Clear Date: 
- Include Time: 

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### Submitter

<table>
<thead>
<tr>
<th>Name</th>
<th>R. Maurer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone</td>
<td>301-922-3221</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:maurrepr@nv.doe.gov">maurrepr@nv.doe.gov</a></td>
</tr>
</tbody>
</table>

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### Event Comments

**Event Description / Comments (Scene Size Up)**

- Drill

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### Location

Reminder: This is an unclassified system. Certain conditions associated with location have the potential to impact the classification of information entered into Triage.

<table>
<thead>
<tr>
<th>Latitude</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitude</td>
<td></td>
</tr>
</tbody>
</table>

**Location Description**

Business located at 125 Main Street, Washington, D.C.
### Event Details

**Event Number**: TE-12-1155

### Attachments

**Uploaded Files**

- **Photo of wooden box.txt**
  - **Description**: Photo of wooden box

### General Addendum Information

**Addendum Comments**

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**Complete Submission**
TRIAGE Website

For a real world event, you would receive a call back from a DOE Official in 15 minutes and an analysis in 1 hour. Continued assistance is available and a final report in 24 hours.
TRIAGE technical assessment based on data provided:

- Isotope is Cs-137
- Activity is 5 Ci (185 GBq)
- Heavily shielded
- No evidence of special nuclear materials
- No evidence of neutron activity
- Risk – concern of high activity source

Is this a concern, what is your assessment?
The National Nuclear Security Administration Triage system has received spectra through the Triage Web for evaluation. The following is a report on the spectra by our Triage Analyst. The quality of the spectra is good. The spectra evaluation indicates there is a presence of moderately shielded Cs-137. There is no evidence of Special Nuclear Material. That is we do not see any spectra lines that would suggest the presence of U-235, Pu-239, Np-237, or Am-241 and there is no evidence of neutron interactions.

The spectrum is from a Bicron Fieldspec Identifier-N instrument. The detailed analysis of the spectra shows there is a shielded Cs-137 source present. The best fit for this source from the information available utilizing the GADRAS program is 5 Curies (Ci) of Cs-137 behind 1 cm of Lead (Pb) shielding. All the normal background lines are present. K-40, Th-232 and daughters, Ra-226 and daughters are present in the spectra. No other isotopes are visible. This amount of radiation activity should cause concern for the Health and Safety of personnel within the area.
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