



Office of Counterterrorism  
and Counterproliferation  
**Nuclear  
Incident  
Policy and  
Cooperation**

# **International Radiological/Nuclear Training for Emergency Response - Major Public Events Virtual Workshop**

**U.S. Department of Energy, National Nuclear Security Administration  
Office of Nuclear Incident Policy and Cooperation**

**Date 2022  
Washington, D.C., U.S.A.**





# Workshop Overview

- Day 1 Major Public Events Overview and Nuclear Security Threats
- Day 2 Radiation Detection and Emergency Response Equipment
- Day 3 Nuclear Security Planning and Operations
- Day 4 Alarm Interdiction and Adjudication and Source Recovery***

Monday – Thursday

09:00-11:00 Washington, DC Time



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## **Virtual Workshop Guidance**

The chat box will be monitored for questions during presentations.

Please keep your microphone on mute. All microphones will be muted at the beginning and during presentations.

If not presenting, please turn off video to preserve bandwidth.

## **Questions?**



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# Alarm Interdiction and Adjudication



# Objective

Understand the process for interdicting and adjudicating radiation alarms and review operational scenarios for radiological emergency response best practices.

## Goals

- Become familiar with the Primary and Secondary Inspection process for alarm interdiction, investigation, and adjudication
- Gain knowledge of common operational scenarios where alarm interdiction, investigation and adjudication are conducted as best practices
- Review several scenarios that could be encountered as part of the Nuclear Security measures for an MPE

# What is Interdiction and Adjudication?

*Radiation alarms will typically result in the interdiction of a person or material and require cooperation between law enforcement and radiation experts*

- Alarms could be triggered by:
  - **Nuclear security measures at a Major Public Event (MPE)**
  - Law enforcement, customs agents, or fire/hazmat personnel with a radiation pager
  - Pedestrian or vehicle radiation portal monitors at airport passenger arrivals, a border checkpoint, or a shipping port
- Once a person or material is detained, the adjudication process begins to determine if the alarm was caused by:
  - Legitimate radioactive material used in commerce
  - Illicit nuclear or radiological material
  - Material Out of Regulatory Control (MORC)

# Interdiction and Adjudication Process

***The interdiction and adjudication process is outlined in 6 steps:***

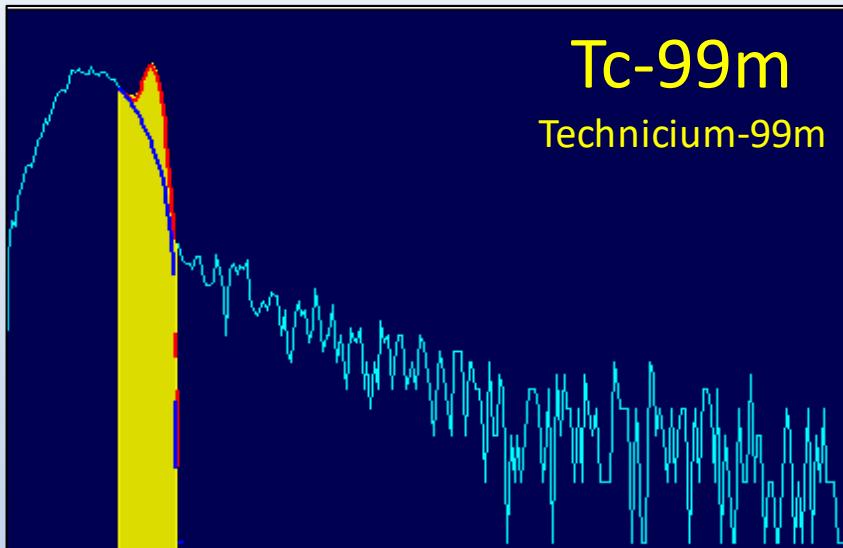
1. **Assess** the hazard and risk to first responders
  - Is the dose rate too high? Is there potential contamination?
2. **Locate** the radiation source
  - Where is the hotspot? A radiation pager can be used to locate and pinpoint the material
3. **Identify** the radioactive material
  - What is the radioactive material? A radioisotope identifier can be used for this process
4. **Document** the information
  - What information is retained? A checklist can aid in this step
5. **Release or Detain**
  - Can the person or material be released? An investigation will be needed to determine
6. **Recover** illicit material: *Secure, Isolate, Notify*

# Radioisotope Identification

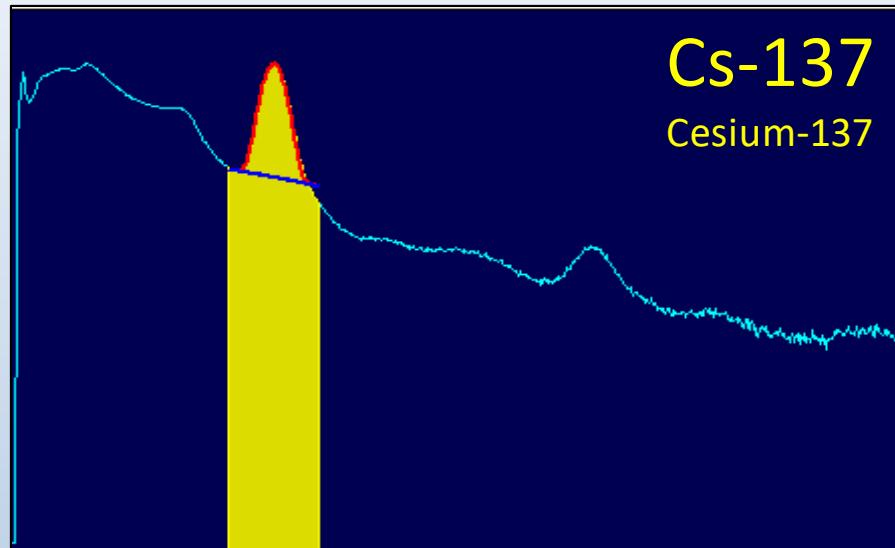
- The first step in adjudicating a radiation alarm is to localize the hotspot with a radiation pager (PRD) and then identify the radioactive material
- The identification process will aid in determining if the radioactive material is legitimate, illicit or a Material Out of Regulatory Control
- Radioactive material identification is determined by using a radioisotope identifier (RIID) – an instrument that takes a **“fingerprint”** of the radioactive material and can aid in the investigation and adjudication process

***Each radioactive material has its own unique fingerprint***

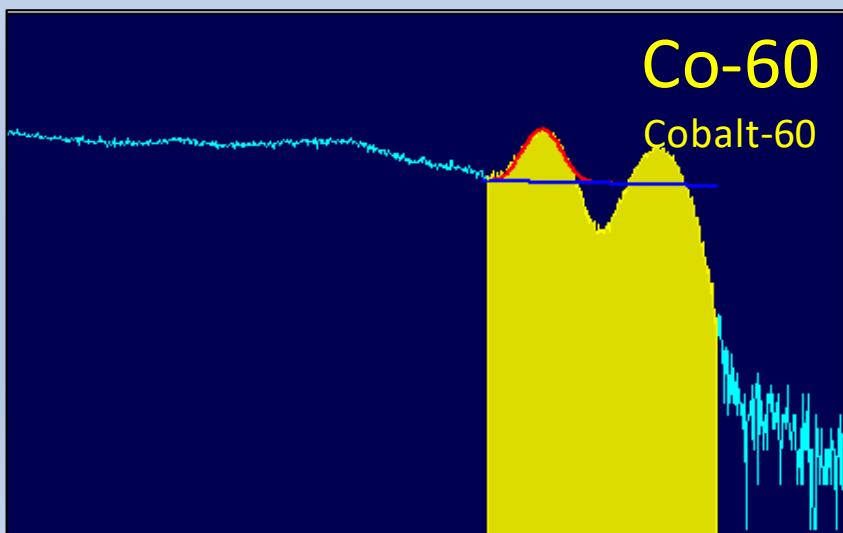
# Radioactive Material *Fingerprints*



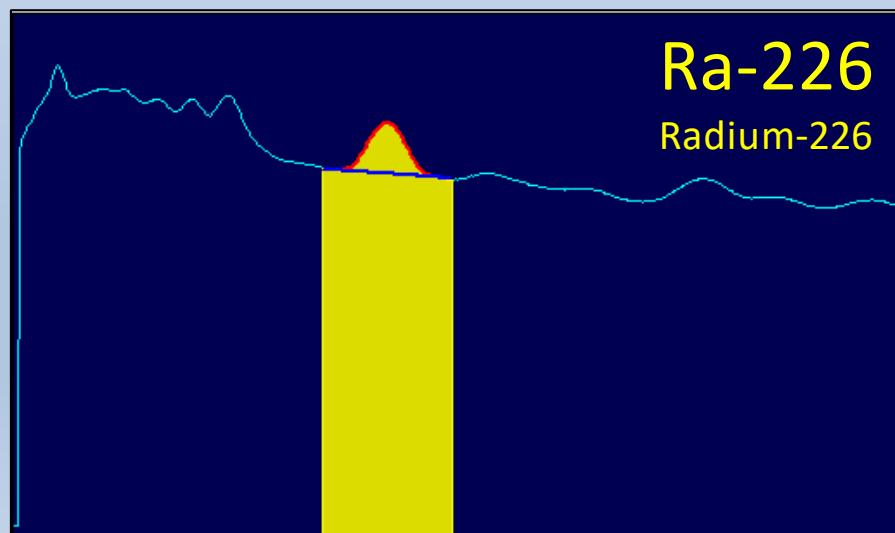
Tc-99m  
Technetium-99m



Cs-137  
Cesium-137



Co-60  
Cobalt-60

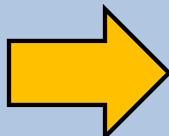


Ra-226  
Radium-226

# Primary versus Secondary

- Primary Inspection – location where the initial alarm detection and interdiction process occurs with a ***Front Line Officer***
- Secondary Inspection – location where the investigation and adjudication process occurs with ***Law Enforcement and Radiation Expert***

Primary  
Inspection  
***Front Line Officer***



Secondary  
Inspection  
***Law Enforcement  
and Radiation Expert***

# Detection Equipment Best Practices

## *Primary Inspection - Personal Radiation Detector (PRD)*



## *Secondary Inspection - RadiolIsotope IDentifiers (RIID)*



# Personal Radiation Detector (PRD)

Personal Radiation Detector (PRD) primarily for routine monitoring, detection, localization and pinpointing radioactive materials

*Also known as a radiation pager*



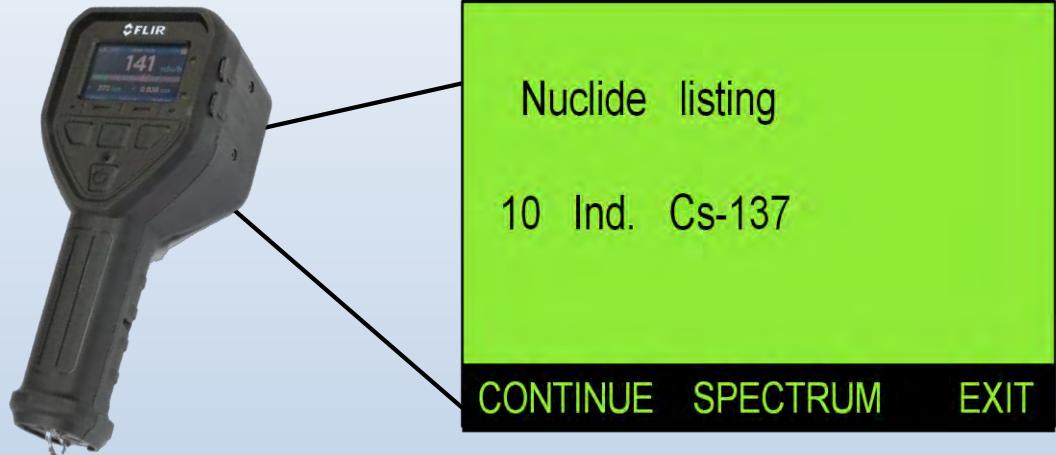
# How is a PRD used at an MPE?

## Primary Inspection at Main Event by a Front Line Officer



# Radiolsotope IDentifier (RIID)

Low resolution sodium iodide gamma detector for ***identification*** of radioactive materials and a small neutron detector



*Detect  
Source*



*Acquire  
Spectrum*



*Library  
Lookup*



*Identify  
Radioisotope*

# How is a RIID used at an MPE?

## PRD in Primary Inspection



## RIID in Secondary Inspection



# **Polling Survey and Discussion**

## **Question 1 (2 minutes)**

Based on best practices for the alarm interdiction and adjudication process, what 2 instruments are used for primary inspection and secondary inspection?

Enter your answer in the chat box

# Interdiction and Adjudication

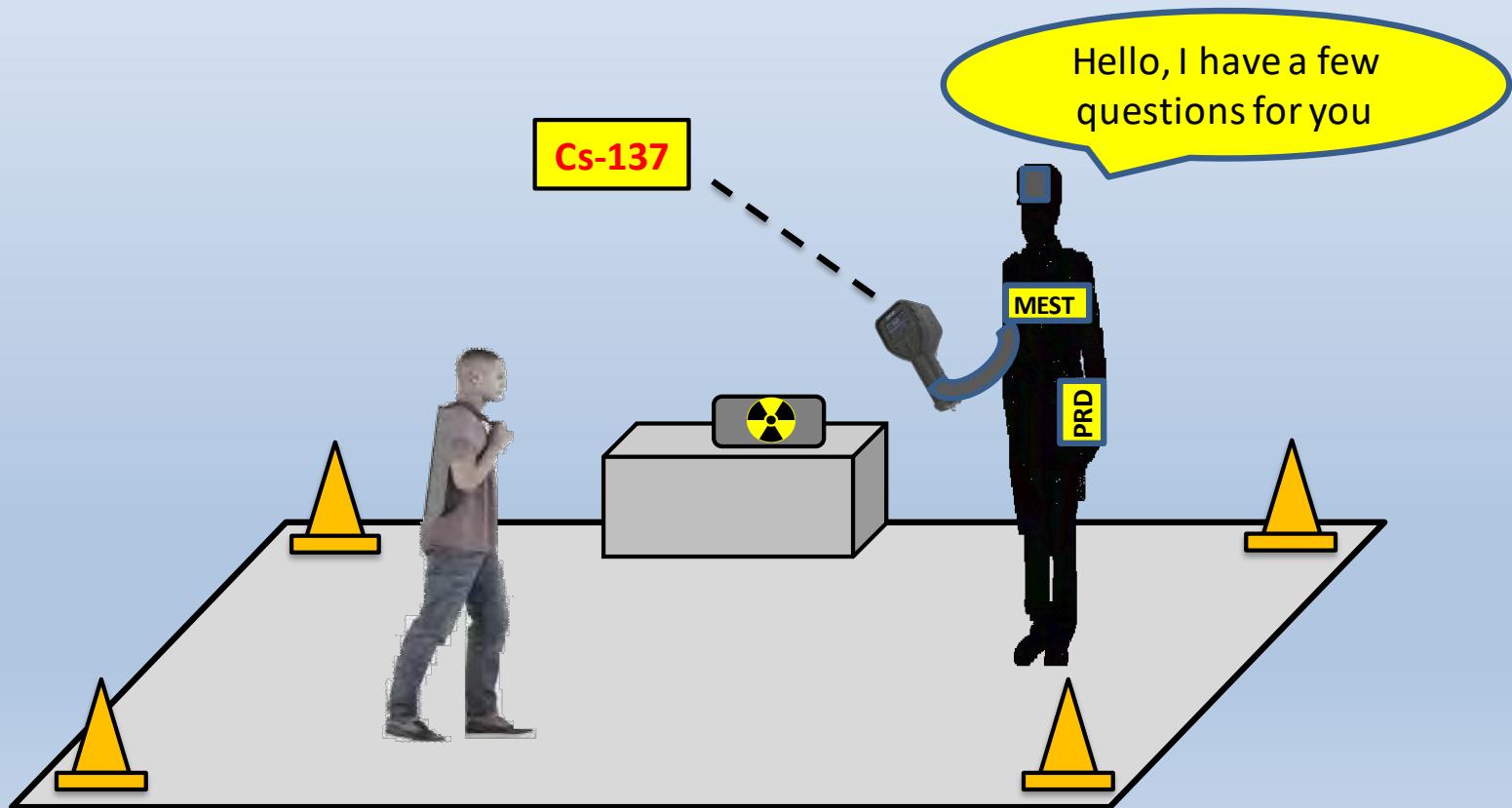
## *Example Scenarios and Best Practices*

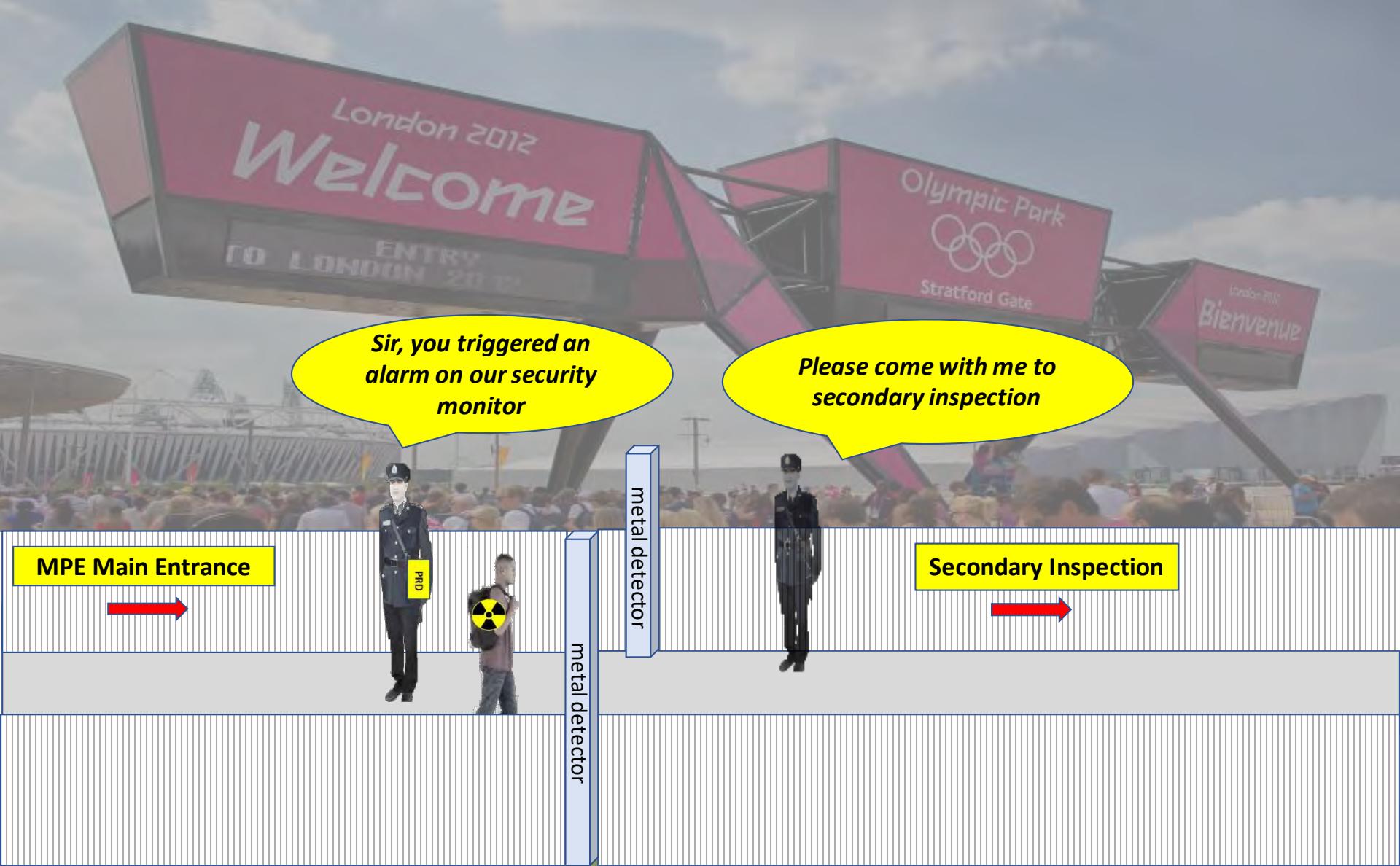


# Scenario 1

## Pedestrian MPE Checkpoint

### Alarm Adjudication in Secondary Inspection



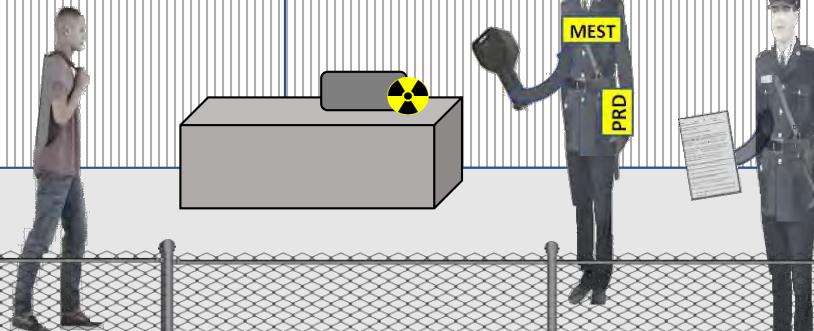




#### Pedestrian Portal Questionnaire Checklist

1. *What is your name, address, phone number?*
2. *Have you had any recent medical treatments involving a radioactive isotope; for example, a stress test or iodine treatment? Yes/No/Not Sure*
3. *Were you issued a medical card? If so, record Test Date, Hospital/Phone, Isotope, Activity*
4. *We would like to take a quick measurement to verify the reading. Please come over here. Our reading confirms the medical isotope. Appreciate your cooperation. Enjoy the match.*

Secondary Inspection



**MEST Analysis to Officer –**  
**Tc-99m is a medical**  
**isotope, dose rate is safe,**  
**and we confirmed the**  
**treatment with his doctor**

# Pedestrian Portal Questionnaire Example

Conduct investigation and adjudication process in Secondary Inspection area with Law Enforcement and Radiation Experts

## Pedestrian Portal Interdiction and Alarm Adjudication Checklist

Name \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Location \_\_\_\_\_  
Initial Alarm: Detector Model \_\_\_\_\_ Alarm Level \_\_\_\_\_

***You have triggered an alarm on our radiation sensor and we would like to ask you a few questions:***

**1. What is your name, address, phone number?** \_\_\_\_\_

**2. Have you had any recent medical treatments involving a radioactive isotope; for example a stress test or iodine treatment?** Yes/No/Not Sure

**3. Were you issued a medical card?** Yes/No, Test Date \_\_\_\_\_

Hospital/Phone \_\_\_\_\_ Isotope \_\_\_\_\_ Activity \_\_\_\_\_

**4. We would like to take a quick measurement to verify the reading.**

Separate person from bag(s) and scan for hotspot. With RIID, conduct a 1 minute ID at 30 cm (1 ft) from hotspot (dead time < 5% or move back)

Enter dose rate \_\_\_\_\_ at 30 cm (1 ft) and ID results \_\_\_\_\_

Medical - Tc-99m, Tl-201, Ga-67, I-123, I-125, I-131, In-111, F-18, Ir-192

Industrial - Cs-137, Co-60, Ir-192, Ra-226, Am-241, U-238, Th-232

Special Nuclear Materials - Pu-239, U-235, U-233, Np-237

Next, scan bag(s) for hotspots. If negative, and ID confirms medical isotope and story is corroborated, then notify individual and release.

***Our reading confirms the medical isotope. Appreciate your cooperation.***

If scan of bag(s) gives a hotspot, then continue interview:

**1. Are there any radioactive materials in your bag?** Yes/No/Not Sure

**2. Security will need to inspect the contents.**

Remove contents and locate hotspot. With RIID, conduct a 1 minute ID.

Enter dose rate \_\_\_\_\_ at 30 cm (1 ft) and ID results \_\_\_\_\_

Radioactive legal items - Ra-226 watch, Th-232 camera lens, U-238 jewelry

If legal item, return item and release. Otherwise, detain and call for experts.

Expert assistance \_\_\_\_\_

# **Polling Survey and Discussion**

## **Question 2 (2 minutes)**

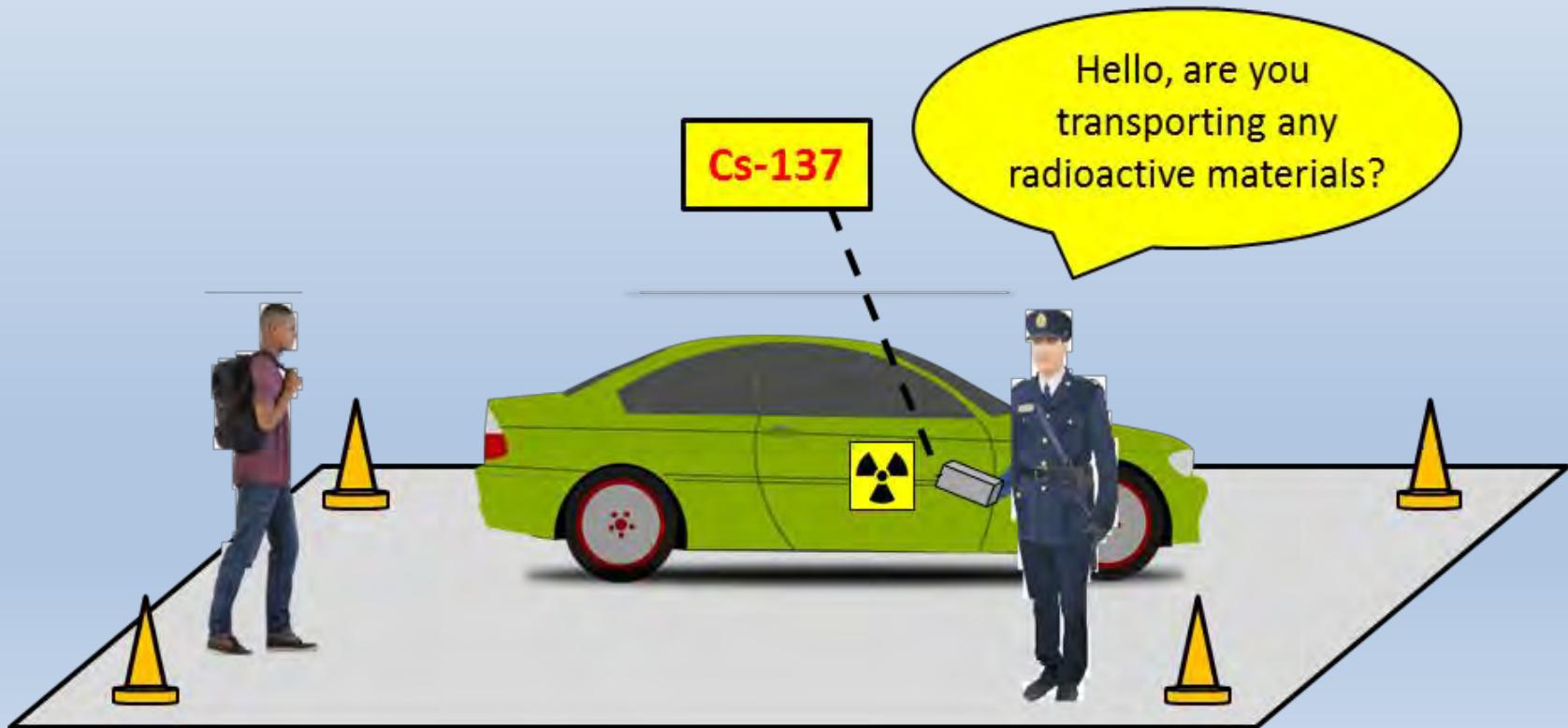
What are the key challenges when conducting interdiction and adjudication operations at a pedestrian radiation portal monitor?

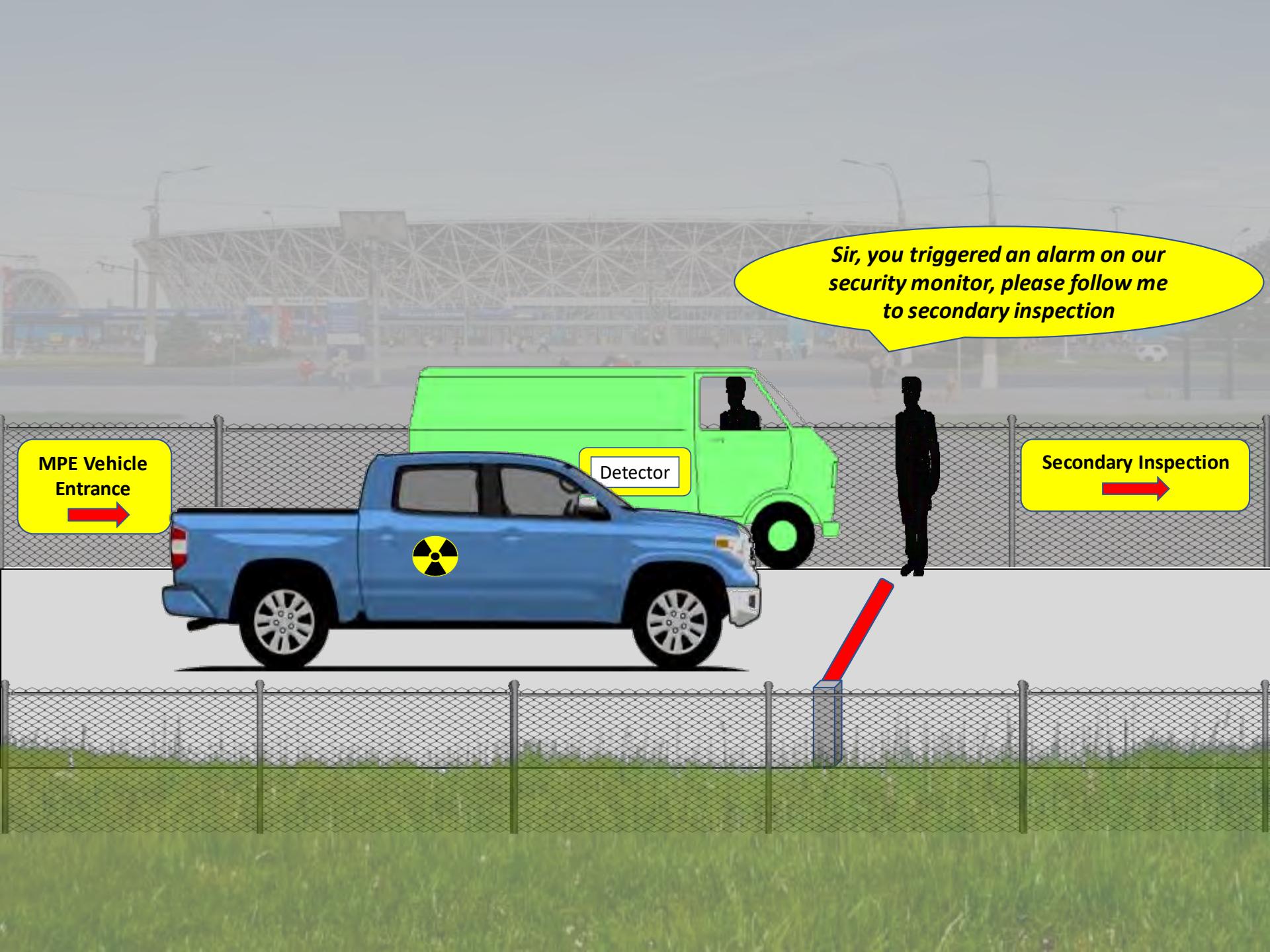
Enter your answer in the chat box

## Scenario 2

### Vehicle Border Checkpoint

#### Alarm Adjudication in Secondary Inspection





*Sir, you triggered an alarm on our security monitor, please follow me to secondary inspection*

MPE Vehicle  
Entrance

Detector

Secondary Inspection

**Vehicle Portal Questionnaire Checklist**

- 1. What is your name, address, phone number?**
- 2. Are you transporting any radioactive materials? If yes, review manifest and shipping documents.**
- 3. We will need to inspect your vehicle and take a quick measurement to verify the reading. Please wait here.**

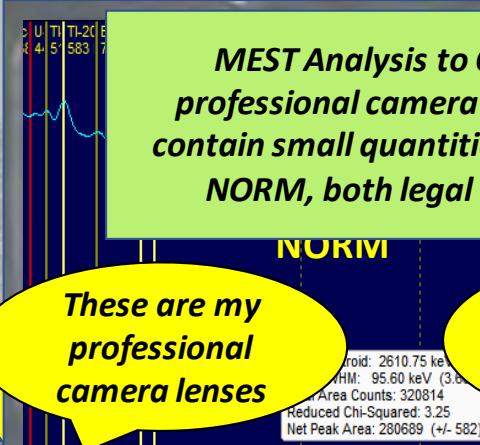
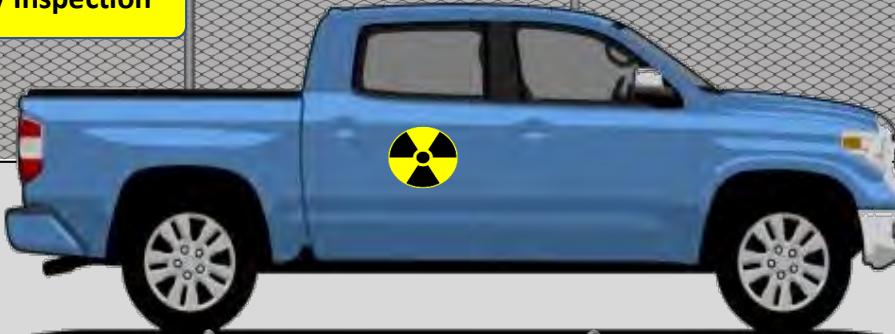
**Our reading confirms Th-232 NORM. You can enter the event. Appreciate your cooperation.**

**MEST Analysis to Officer – professional camera lenses can contain small quantities of Th-232 NORM, both legal and safe**

**These are my professional camera lenses**

**Please open the bag in the backseat**

**Secondary Inspection**



# Vehicle Portal Questionnaire Example

Conduct investigation and adjudication process in Secondary Inspection area with Law Enforcement and Radiation Experts

## Vehicle Portal Interdiction and Alarm Adjudication Checklist

Name \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Location \_\_\_\_\_  
Initial Alarm: Detector Model \_\_\_\_\_ Alarm Level \_\_\_\_\_

***You have triggered an alarm on our radiation sensor and we would like to ask you a few questions.***

1. ***Are you transporting any radioactive materials?*** Yes/No/Not Sure

2. If yes, ***Please provide your shipping documents.***

Name/Company/Phone \_\_\_\_\_

Vehicle Make/Model/License \_\_\_\_\_

Cargo Info \_\_\_\_\_

Hazmat label \_\_\_\_\_ Isotope \_\_\_\_\_ Activity \_\_\_\_\_ TI \_\_\_\_\_

3. ***We will need to inspect the cargo, please open your vehicle.***

Locate cargo hotspot and with a RIID and conduct a 1 minute ID.

Enter dose rate \_\_\_\_\_ at 30 cm (1 ft) and ID results \_\_\_\_\_

Radioactive legal shipments - density gauges, medical isotopes, radiography camera, tiles, granite, porcelain, ores, bricks, fertilizer, kitty litter

Medical - Tc-99m, TI-201, Ga-67, I-123, I-125, I-131, In-111, F-18, Ir-192

Industrial - Cs-137, Co-60, Ir-192, Ra-226, Am-241, U-238, Th-232

Special Nuclear Materials - Pu-239, U-235, U-233, Np-237

***Everything is in order, but for security reasons, we cannot allow radioactive materials into this venue.*** Otherwise, detain and call for assistance.

4. If no, ***Have you had any recent medical treatments involving a radioactive isotope; for example a stress test or iodine treatment?*** Yes/No/Not Sure

5. ***Were you issued a medical card?*** Yes/No, If yes, Test Date \_\_\_\_\_

Hospital/Phone \_\_\_\_\_ Isotope \_\_\_\_\_ Activity \_\_\_\_\_

6. ***We would like to take a quick measurement to verify the reading.***

Separate person from vehicle . Scan person then vehicle for hotspot. With RIID, conduct a 1 minute ID at 30 cm (1 ft) from hotspot (dead time < 5% or move back). Enter dose rate \_\_\_\_\_ at 30 cm (1 ft) and ID results \_\_\_\_\_

***Medical confirmed or legal radioactive item found in vehicle. Inform of results, and if corroborated, release.*** Otherwise, detain and call for experts.

Expert assistance \_\_\_\_\_

# **Polling Survey and Discussion**

## **Question 3 (2 minutes)**

What are the key challenges when conducting interdiction and adjudication operations at a vehicle radiation portal monitor?

Enter your answer in the chat box

# Expert Assistance

- If the alarm cannot be resolved by the Secondary Inspection investigative process, then the person or cargo will continue to be detained and supervisors are notified
- Supervisors may call in additional experts such as the Competent Authorities Mobile Emergency Support Team (MEST), or other emergency response teams with radiation experience
- If the alarm is caused by illicit or Material Out of Regulatory Control, then a source recovery operation may be warranted
- **International assistance is also available thought the IAEA Response and Assistance Network (RANET) or the U.S. Department of Energy Radiological TRIAGE program**

- **Radiological TRIAGE**

On-call technical support for analysis of nuclear data including gamma spectra for radioisotope identification



Radiological Analysis for  
First Responders

# Summary

- The Primary and Secondary Inspection process is a best practice for interdicting and adjudicating radiation alarms
- The interdiction and adjudication process can be applied to a wide range of operational scenarios
- Best practices are used to resolve the incident in a timely and professional manner
- Checklists can provide standardization to the investigation and documentation process
- Documentation is a part of the adjudication process



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# Alarm Interdiction and Adjudication Questions/Discussion

