

Radiological Investigation with the Polaris-H CZT Imaging Gamma Spectroscopy System at D. C. Cook

By:

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2015 ISOE NATC Alara Symposium

Overview

1. Hydrolase Event
2. Elevated Dose Rates in HTC
3. U1 W CTS Hx Elevated Dose Rates
4. Waste Gas System Elevated Dose Rates

Hydrolase Internal Contamination Event

- Hydrolase hoses used inside the U1 North Deborating Demineralizer were unexpectedly found to be internally contaminated with radioactive water.
- Plant demineralized water was being used as the water source for the high pressure washing activity.

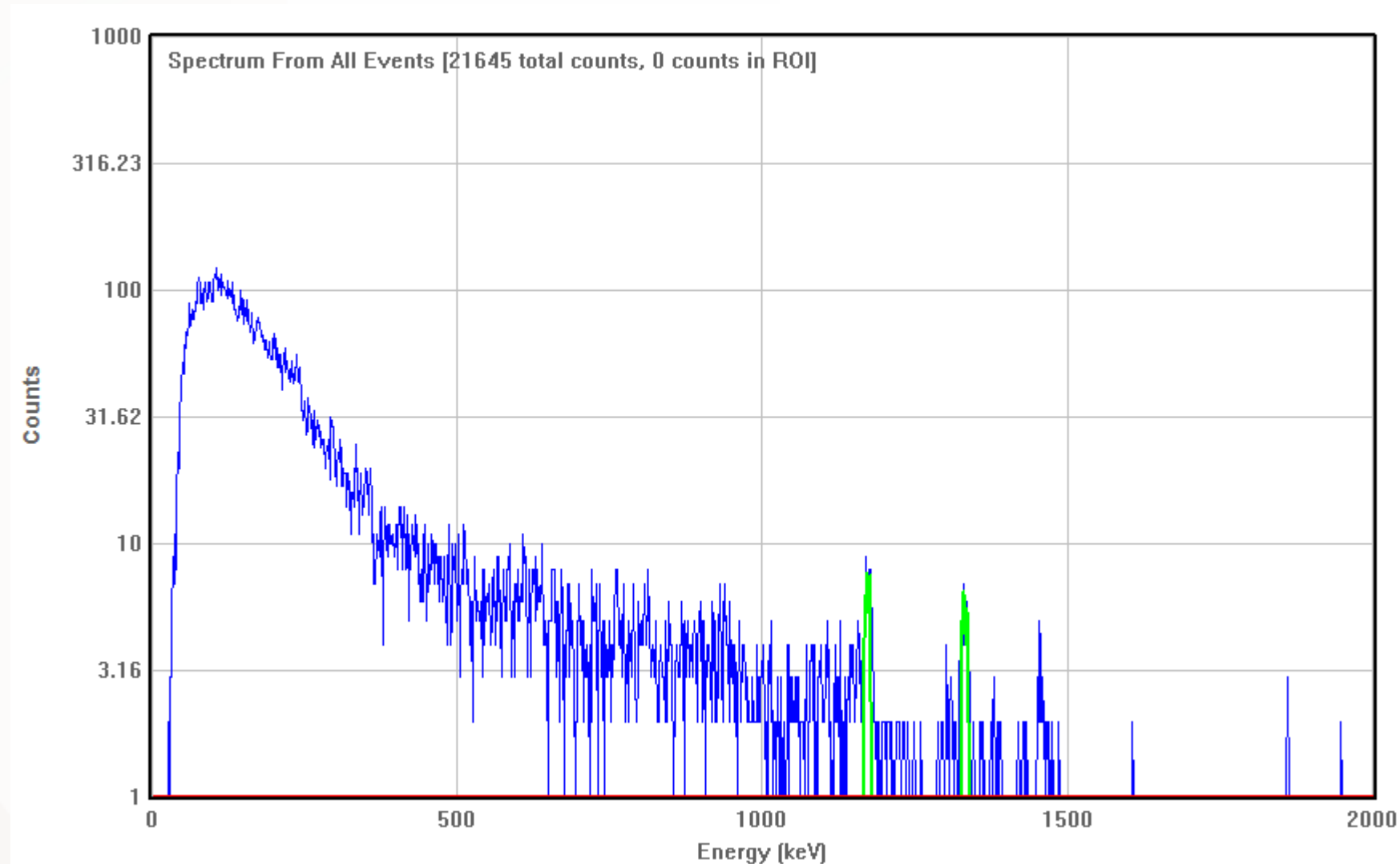
Hydrolase Internal Contamination Event

- Two workers disconnecting hoses had shoe contamination up to 6,000 ccpm, 150,000 dpm/100 cm² system contamination
- Polaris-H system used to assist with decon of the room and image internal system contamination
- 5 of 15 2014 percons were from the Hydrolase Event

Hydrolase Internal Contamination Event

- Cause of internal contamination is the hose in the station drain line syphoned back into hydro pump.
- Check valve failed
- Hoses are usually drained on completion. Due to time constraints this did not happen.

Hydrolase Internal Contamination Event

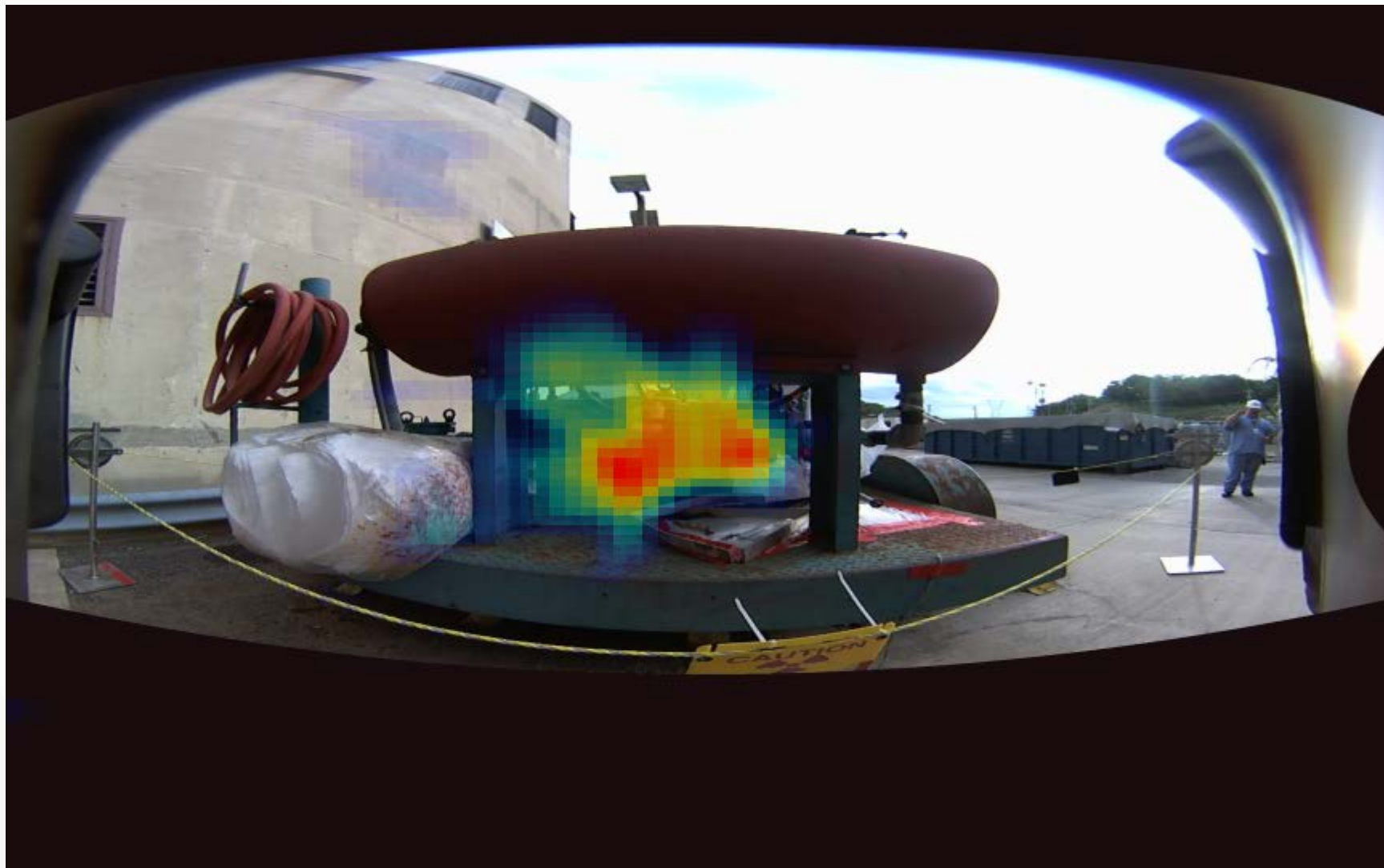


Measurement date: 07-25-2014

Measurement time(s): 08:31:34 (45.5 min)

Selected Isotope(s): * Co-60

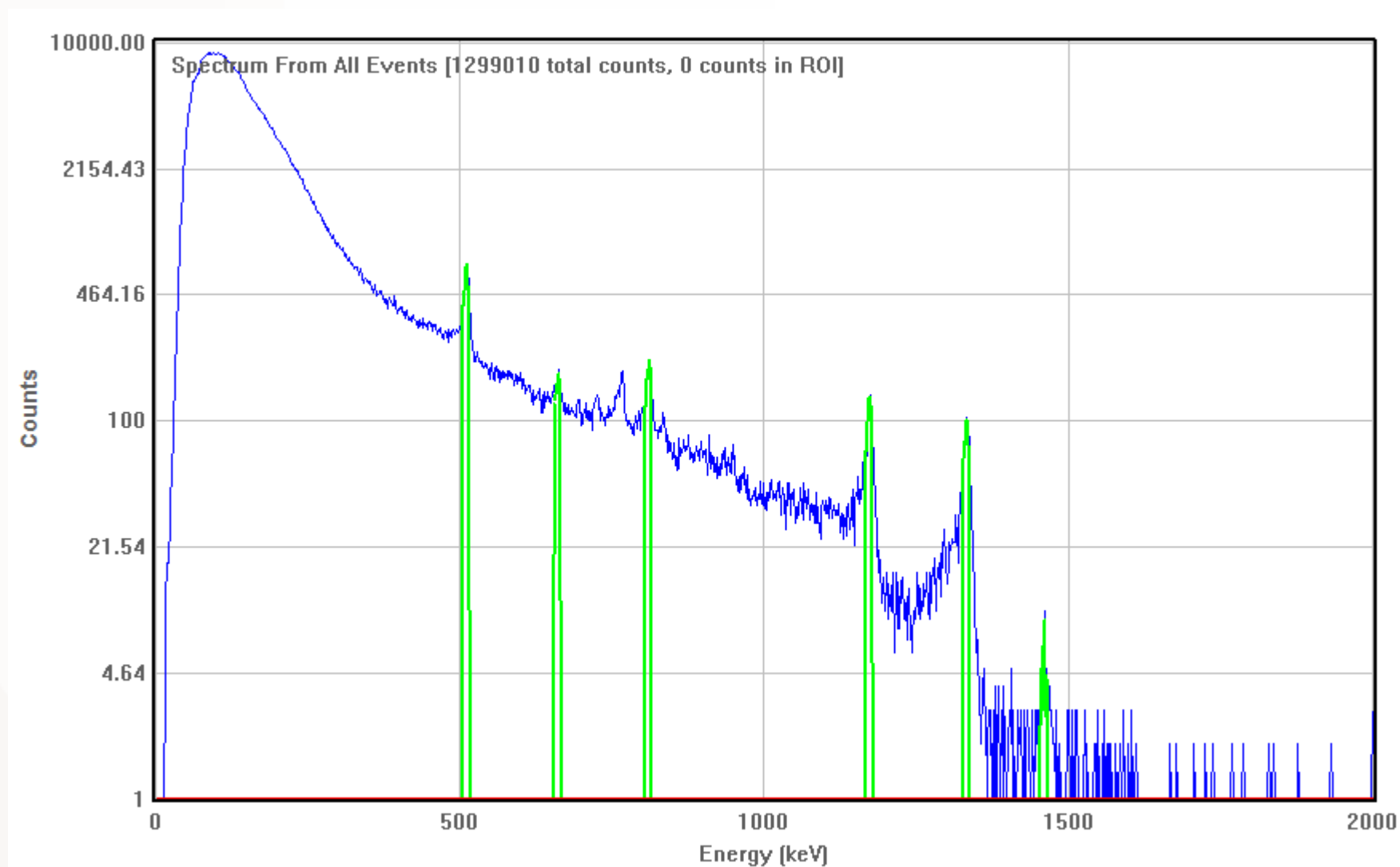
Hydrolase Internal Contamination Event



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Hydrolase Internal Contamination Event



Co-58, Co-60, Nb-95, Zr-95 & Cs-137

Hydrolase Internal Contamination Event



Measurement date: 07-30-2014

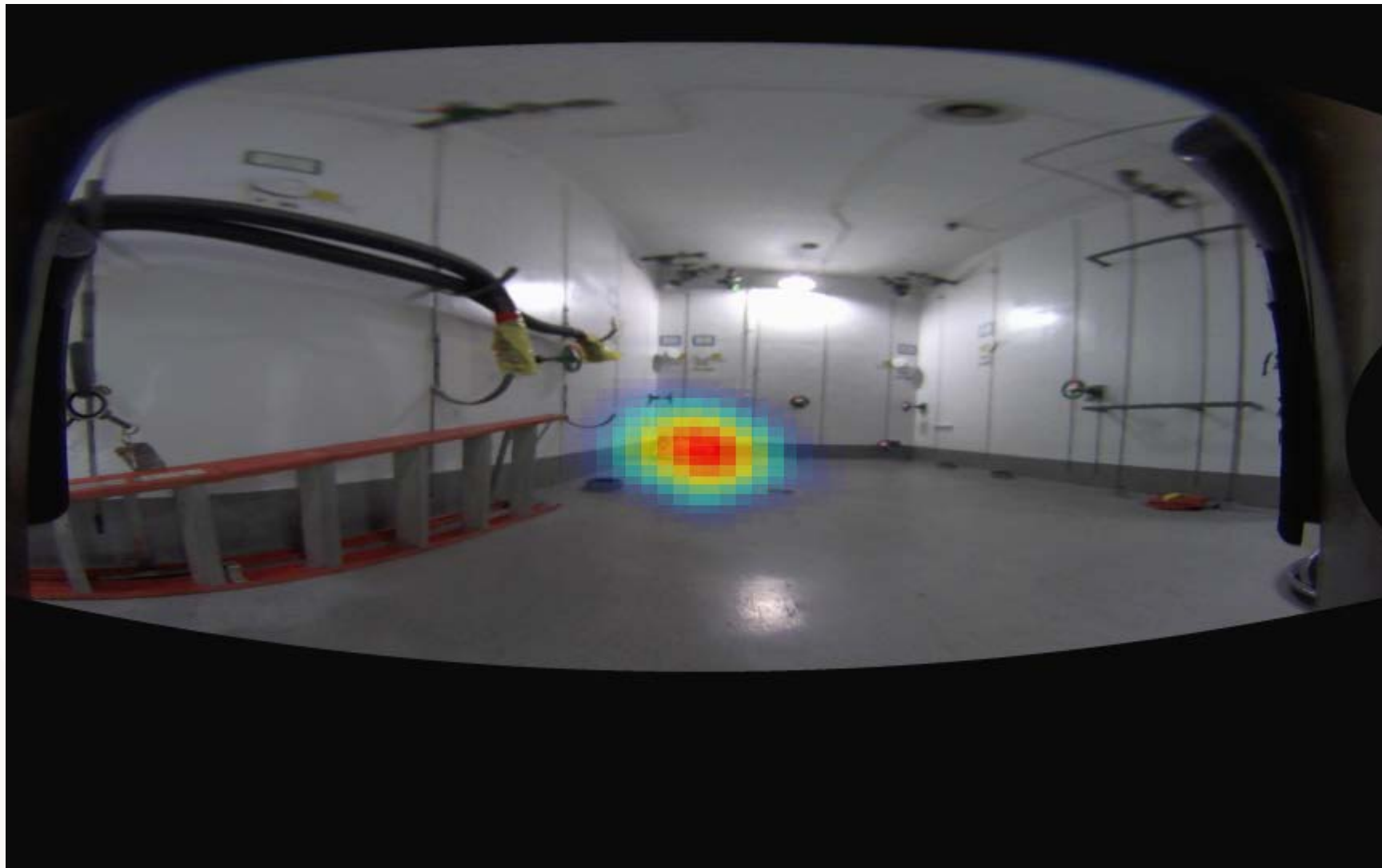
Measurement time(s): 10:53:30 (67.7 min)

Selected Isotope(s): Co-58, Co-60, Cs-137, Nb-95

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Hydrolase Internal Contamination Event



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Hydrolase Internal Contamination Event



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Hydrolase Internal Contamination Event

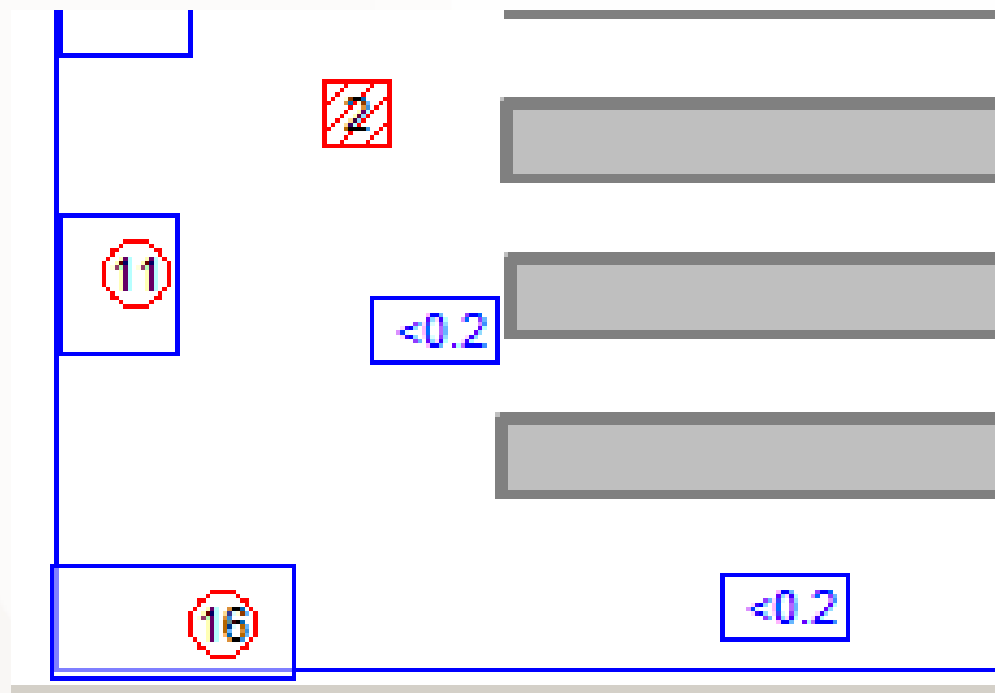
Corrective Actions:

- New hydro pump was procured
- Now pump into 55 gallon drums then to station drains
- Procurement of in-line check valve to prevent backflow
- Plant DI water was sampled at the source to the hydrolaser and found to contain no contamination
- No activity from this event entered the plant DI system

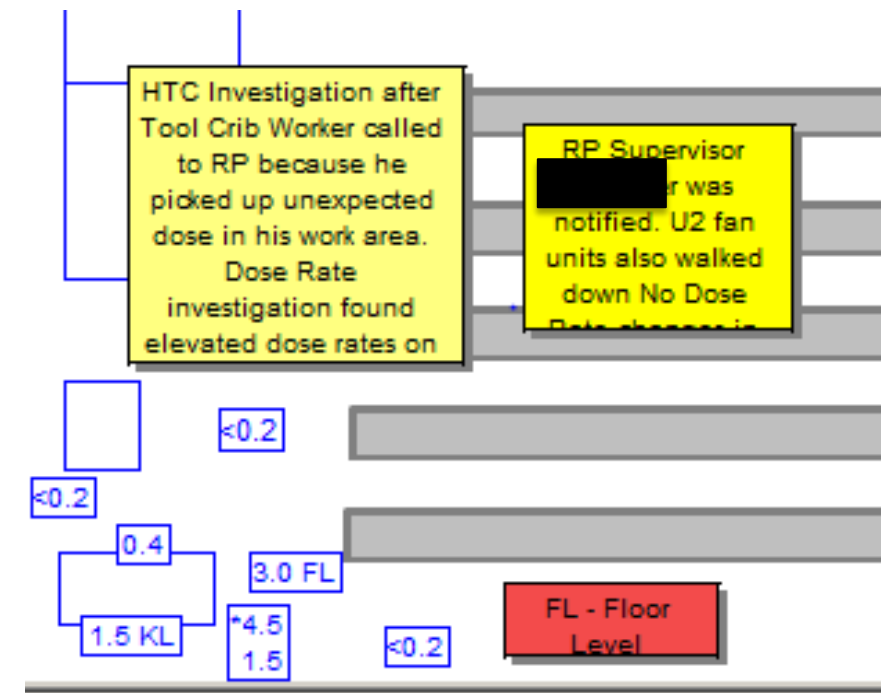
Elevated Dose Rates in Hot Tool Crib

- On 9/10/14, a tool crib worker received an unexpected dose accumulation of 0.1 mRem while in the Hot Tool Crib (HTC).
- Dose was streaming through the floor covers from a drained demin vessel.

Elevated Dose Rates in Hot Tool Crib

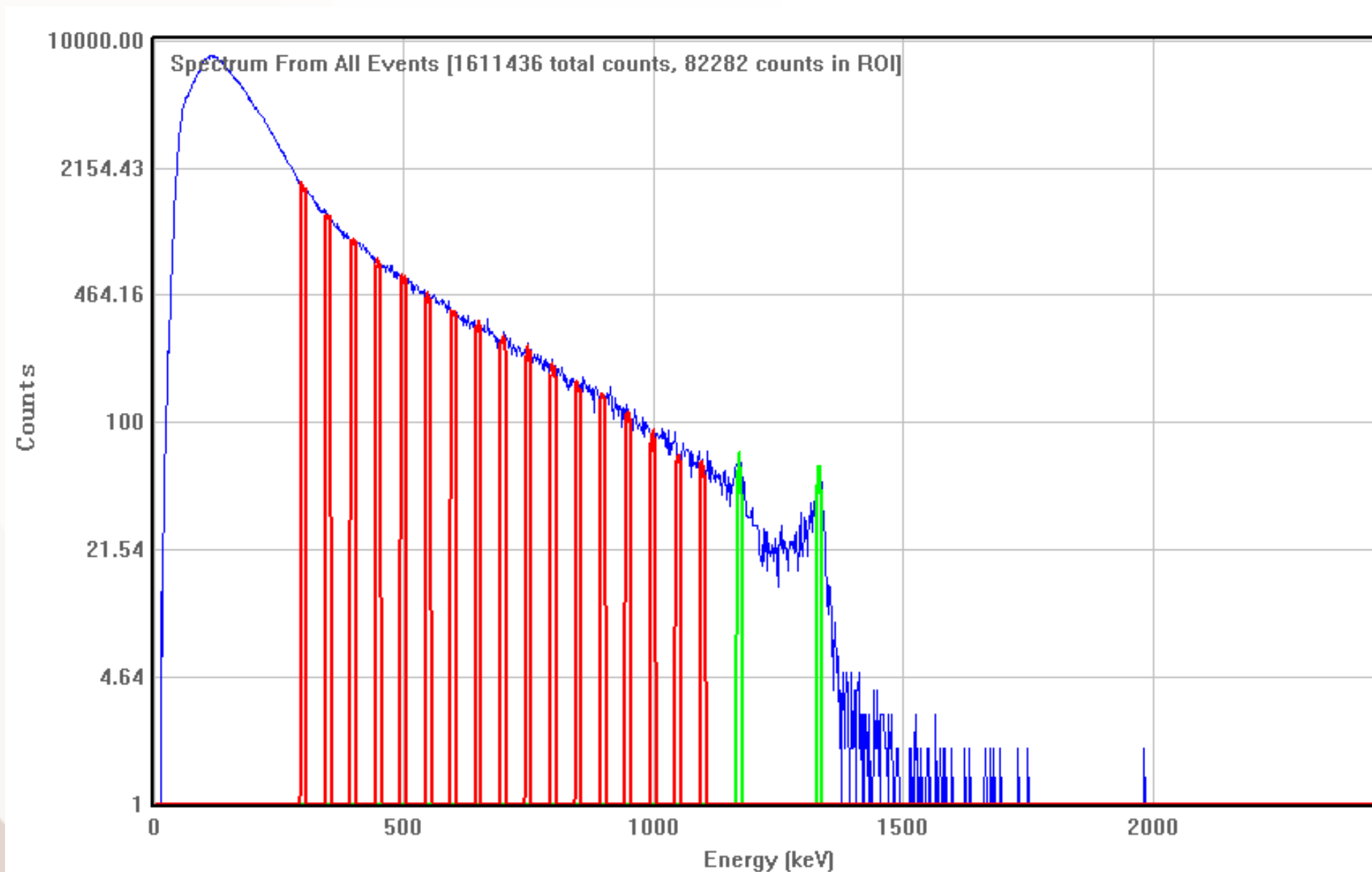


Typical Dose Rates



Elevated Dose Rates (9/10/14)

Elevated Dose Rates in Hot Tool Crib



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Elevated Dose Rates in Hot Tool Crib

Image of Co-60:

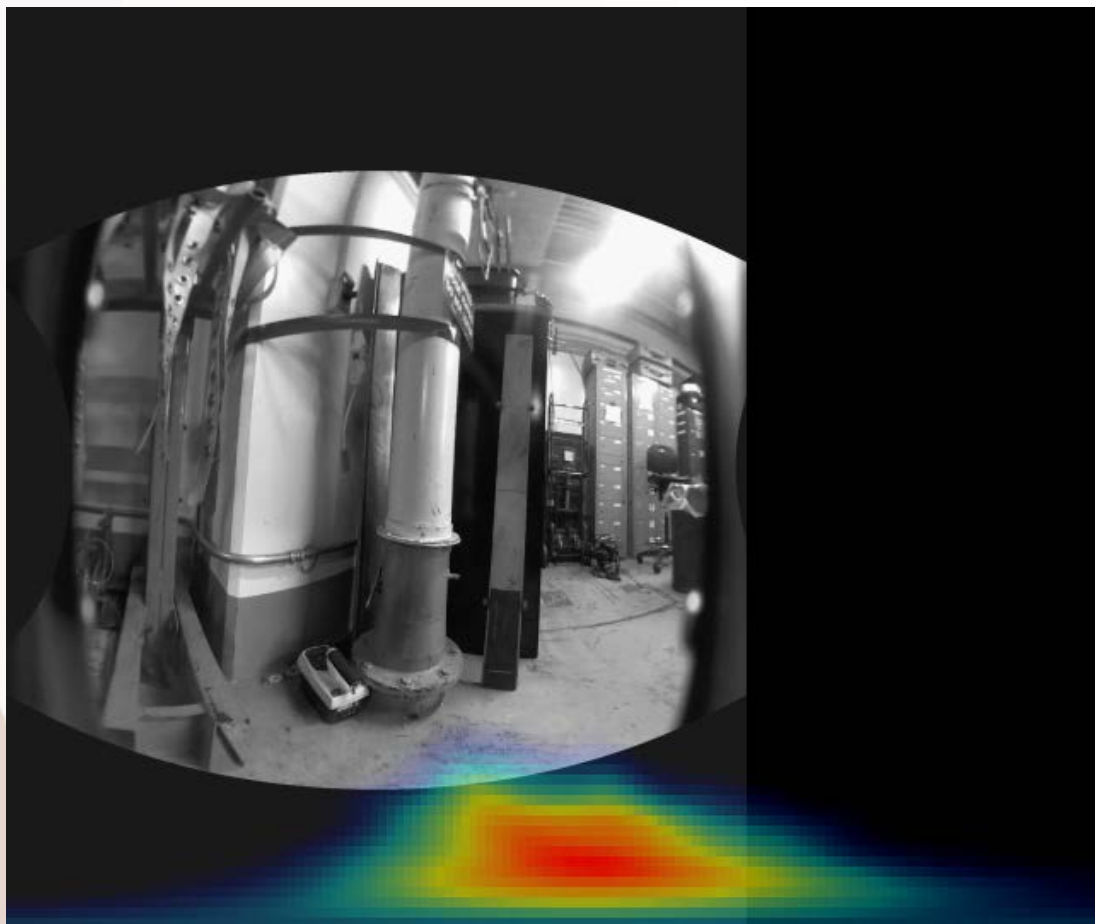
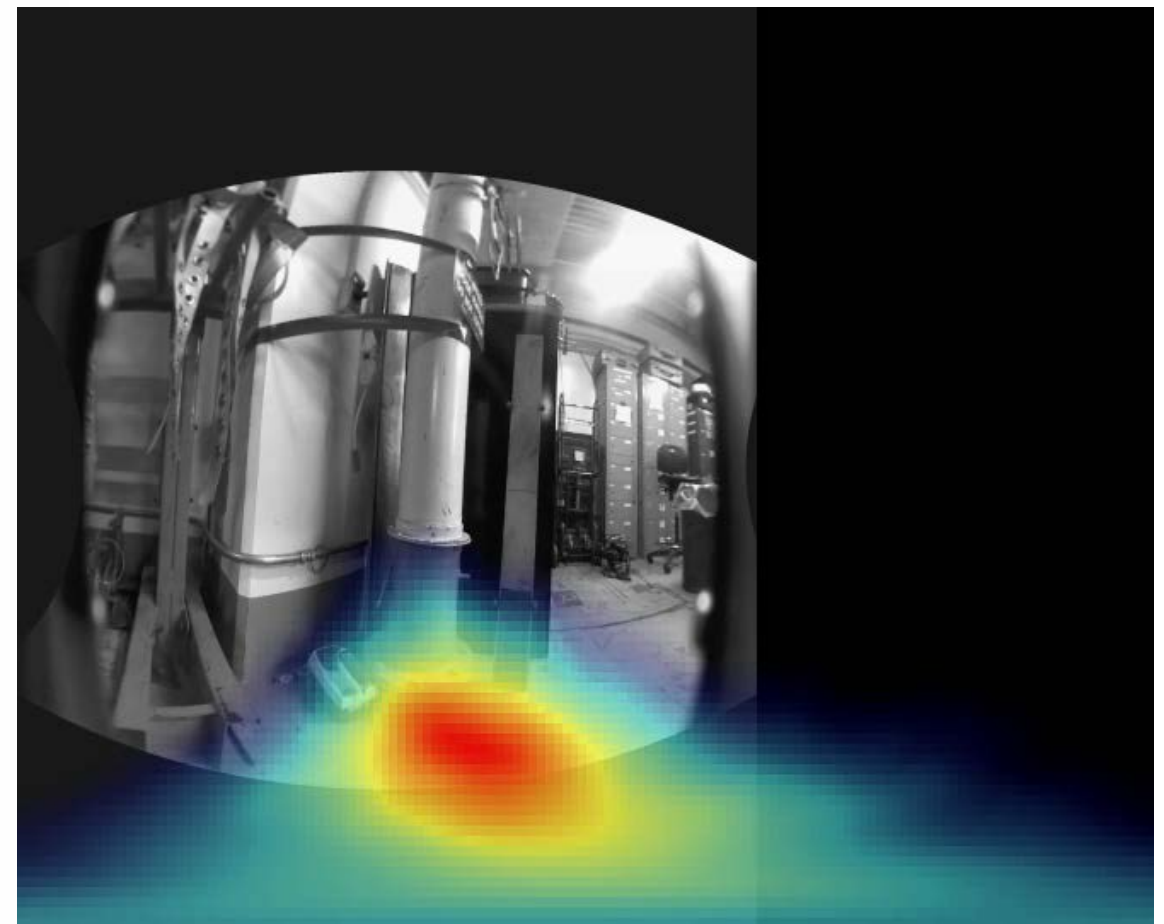


Image of Scatter:



Elevated Dose Rates in Hot Tool Crib

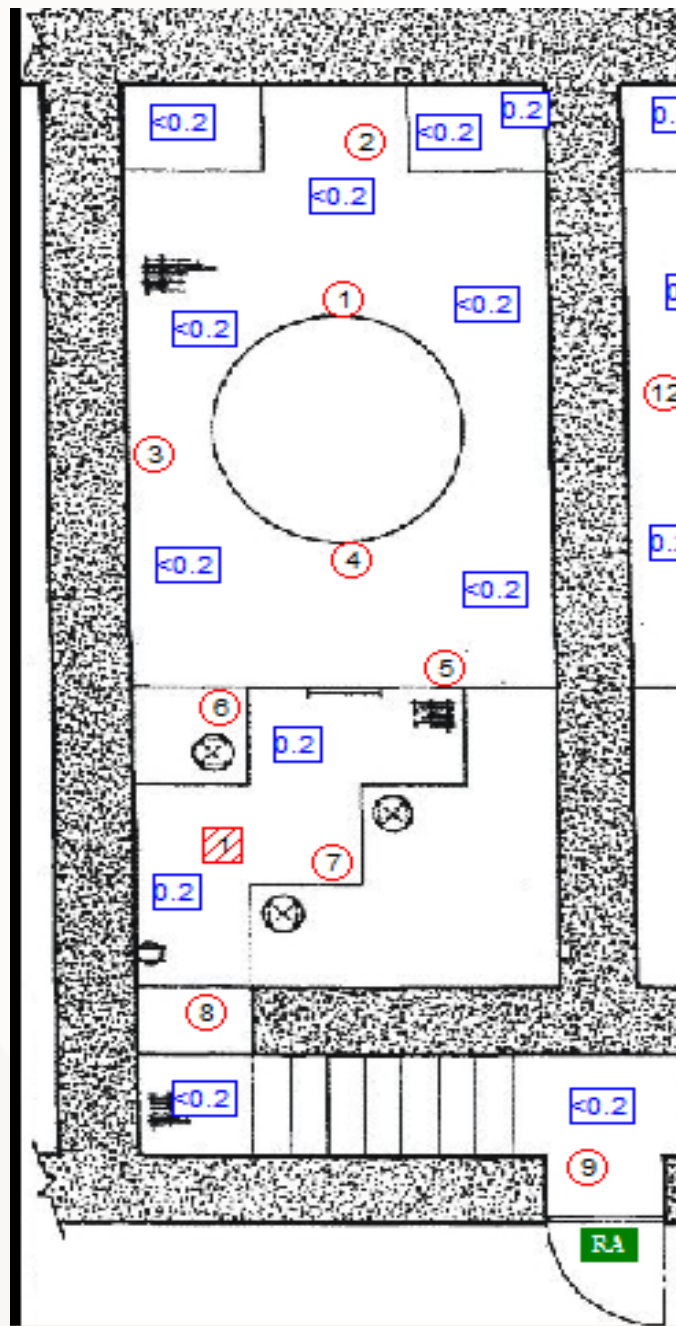
Results of the Imaging:

- HTC Workers Instructed to avoid whole area near floor cover
- Increased Importance to Refill Demin prior to refueling outage
- Filled Demin decreased Dose Rates

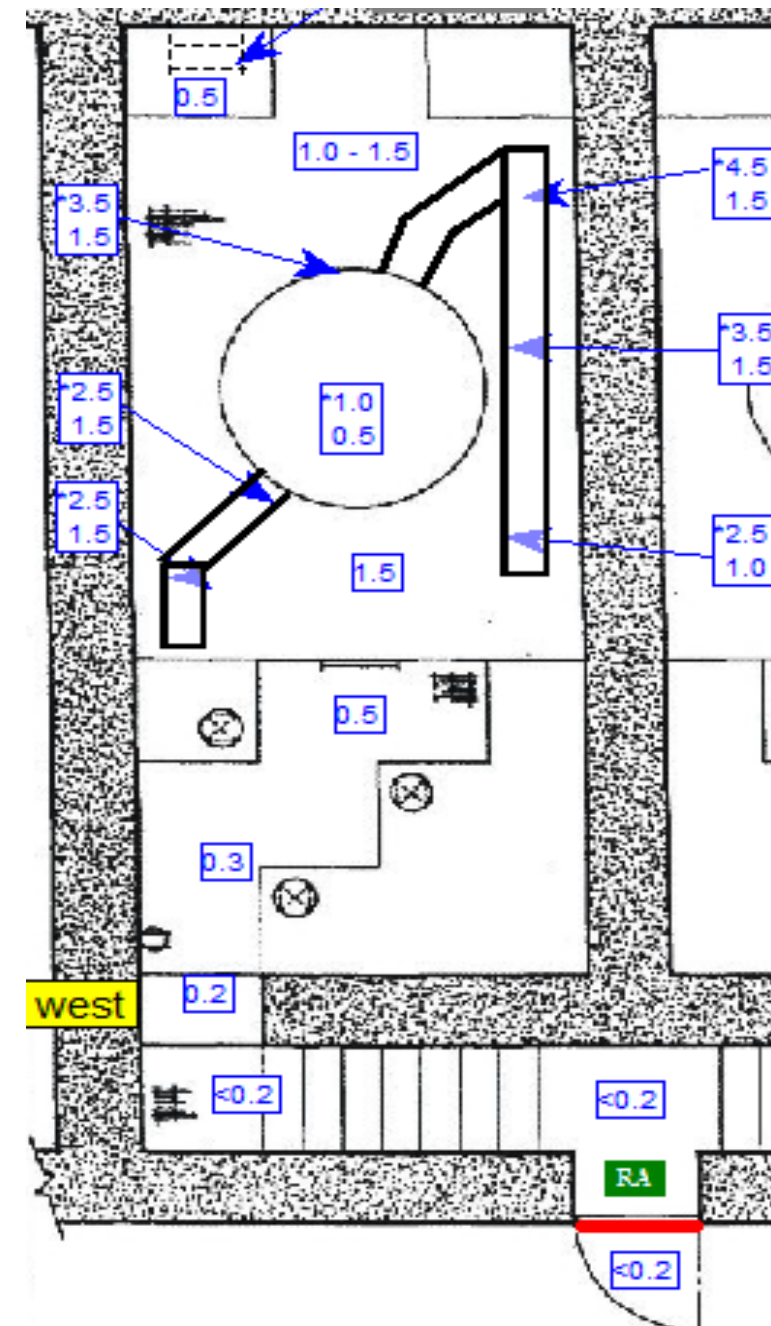
Elevated Dose Rates in CTS Hx Room

- On 11/6/2014 elevated dose rates were found in the U1 W Containment Spray (CTS) Hx Room
- Room already Radiation Area due to E CTS Hx

Elevated Dose Rates in CTS Hx Room

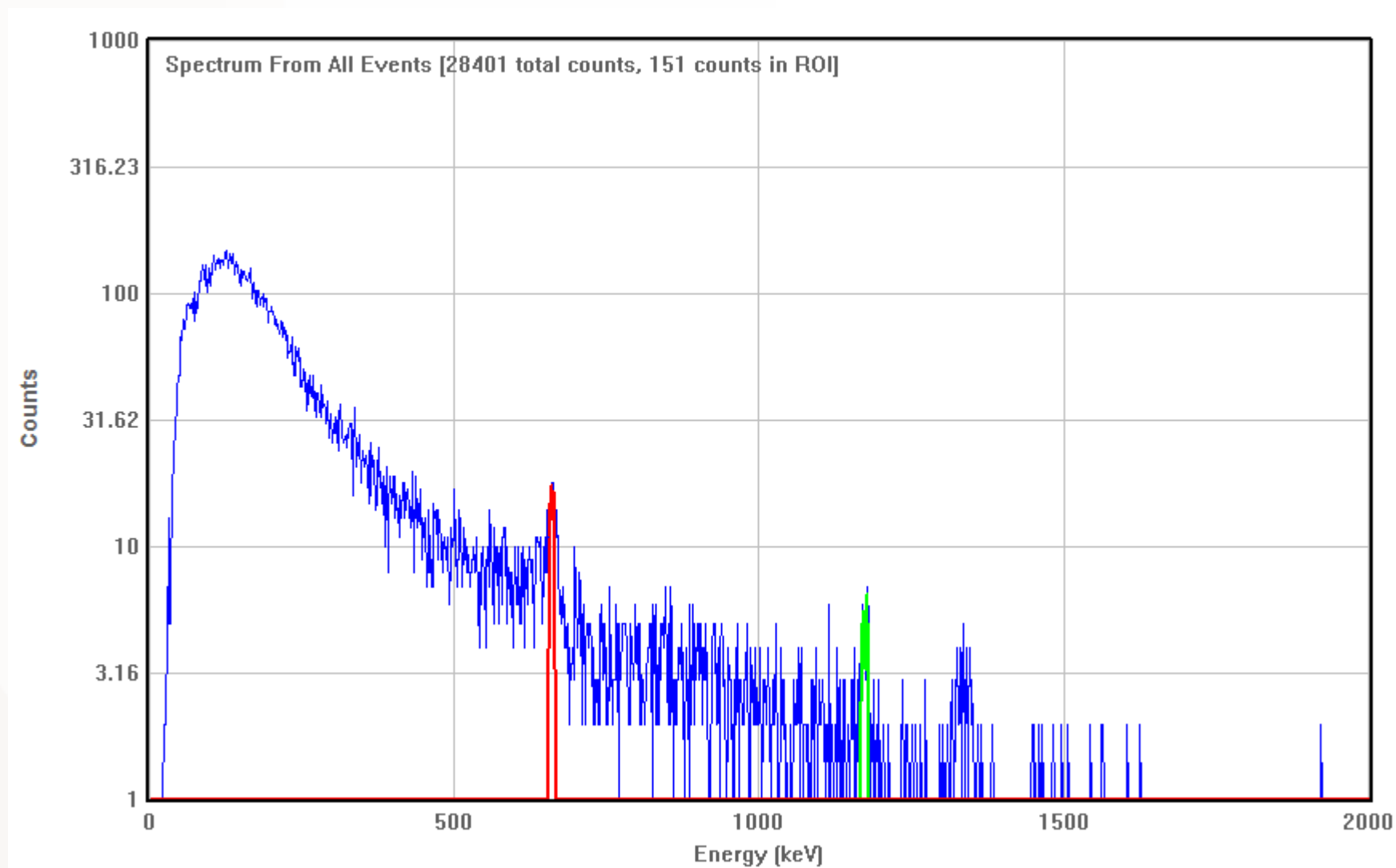


11/3 – Routine Survey



11/6 – Post Leak Testing

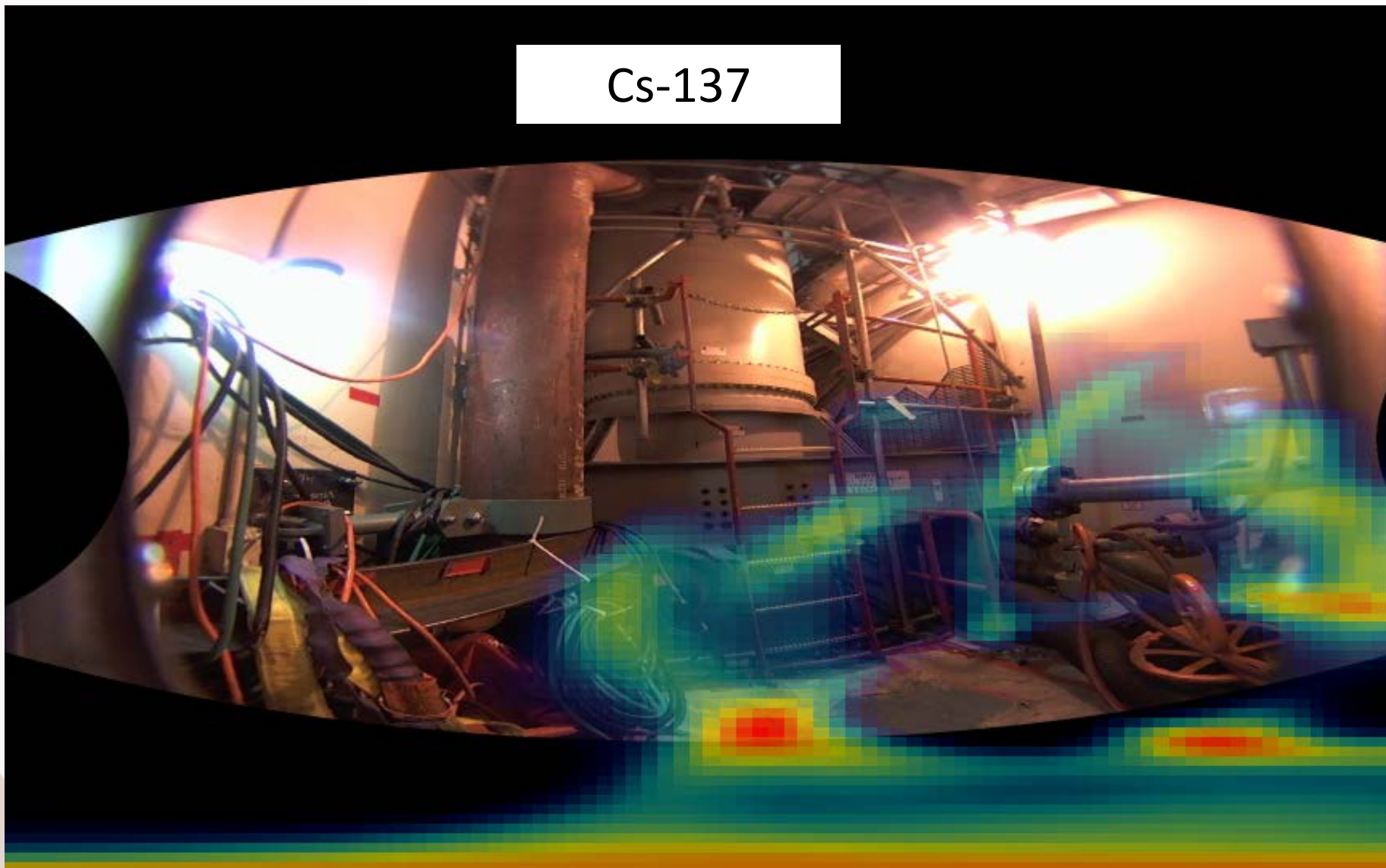
Elevated Dose Rate in CTS Hx Room – Normal Dose Rates



Percon Investigation from 10/1/14

Elevated Dose Rate in CTS Hx Room – Normal Dose Rates

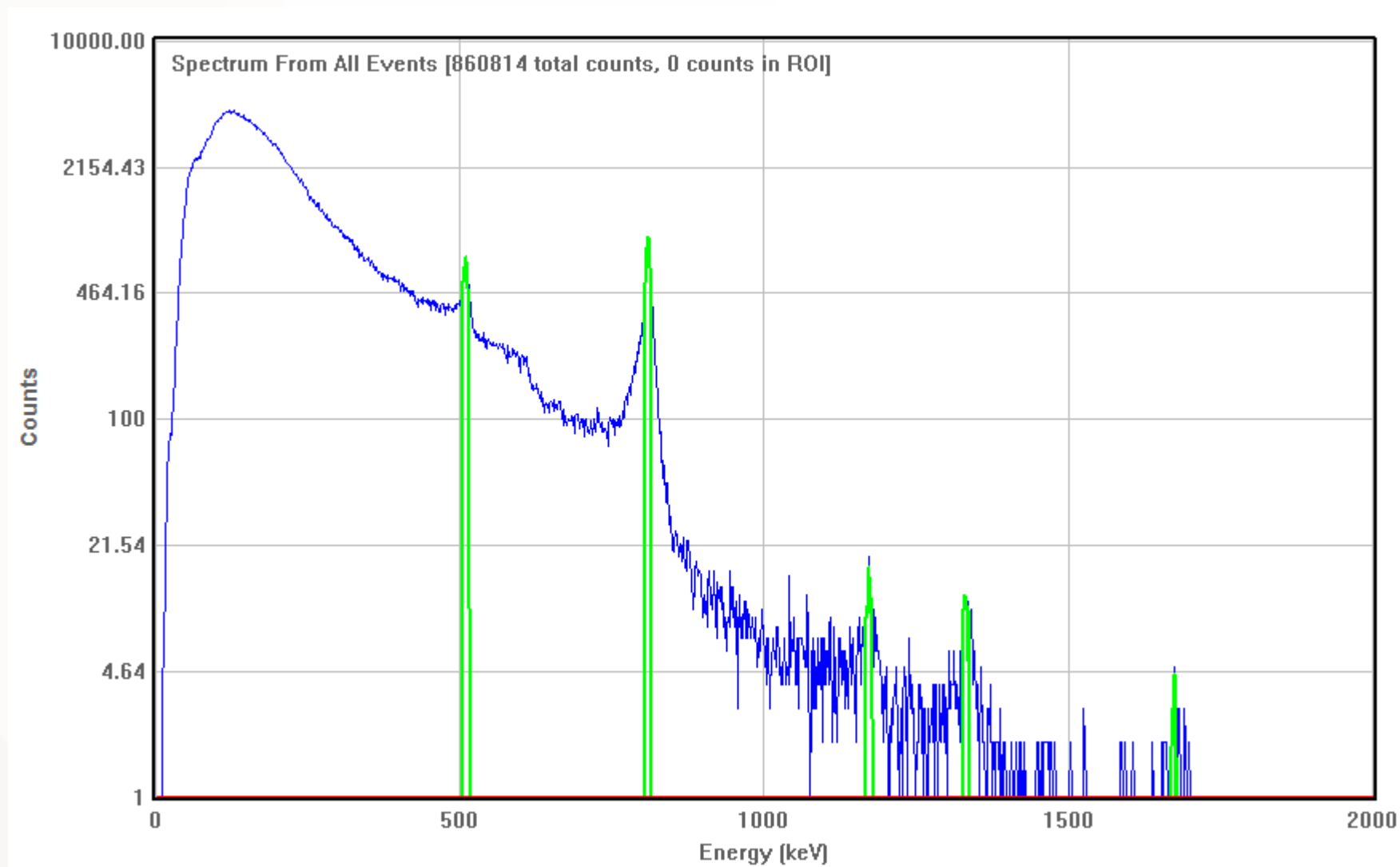
Cs-137



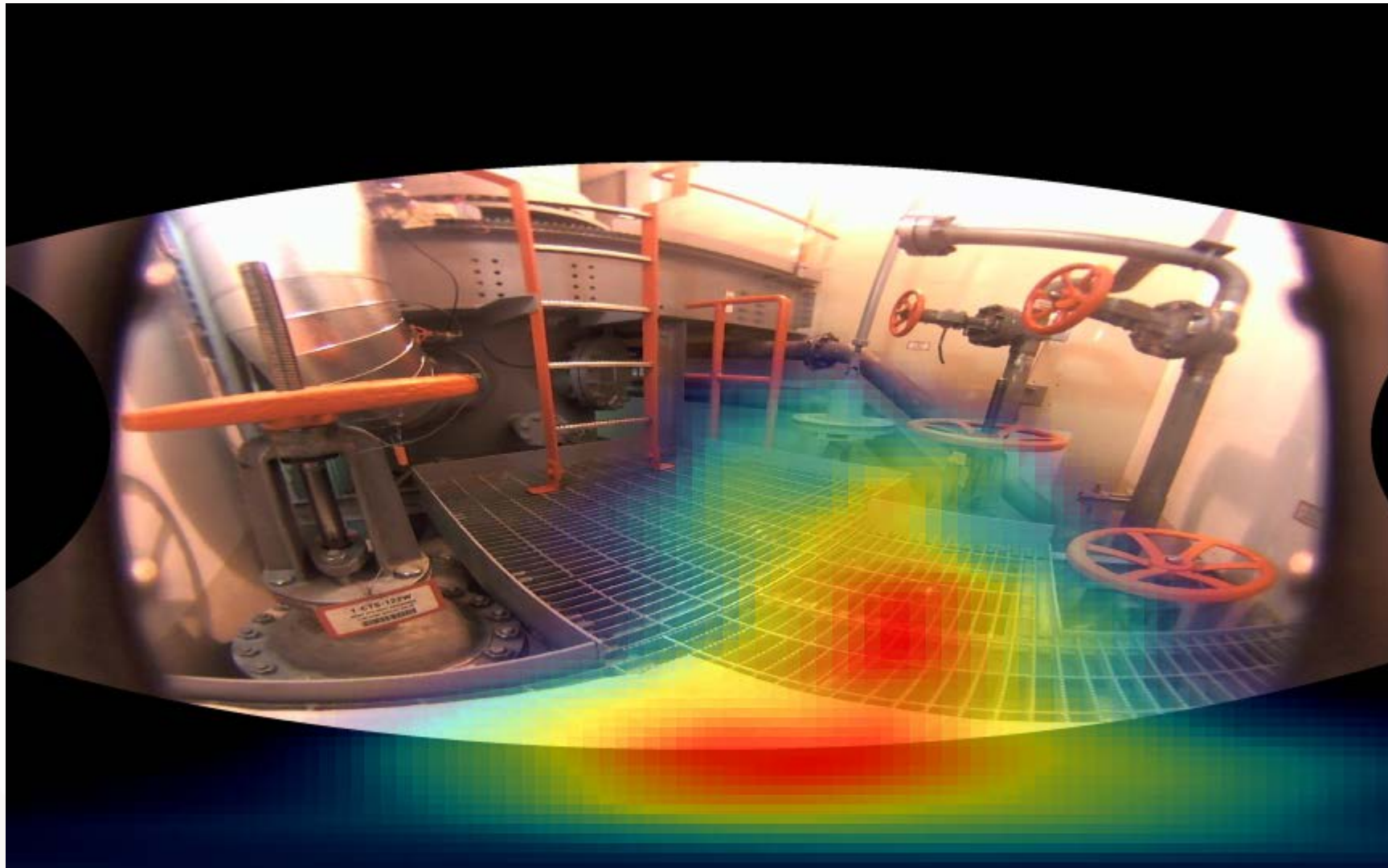
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Elevated Dose Rates in CTS Hx Room

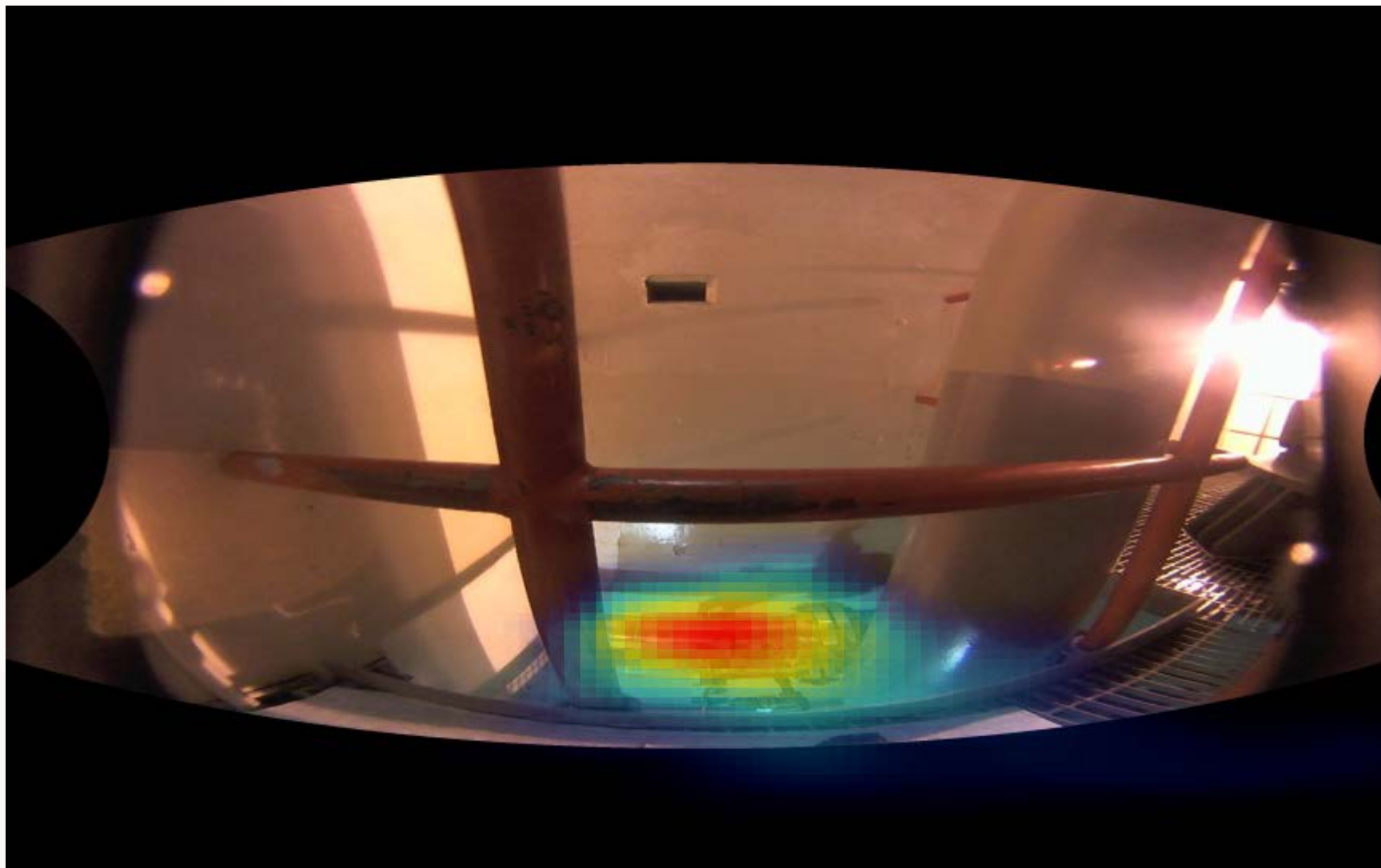


Elevated Dose Rates in CTS Hx Room



Co-58 – Highest contact DR: 2.1 mR/hr
– Highest GA DR: 0.5 mR/hr

Elevated Dose Rates in CTS Hx Room



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Elevated Dose Rates in CTS Hx Room

- Co-58 was primary contributor to increased dose rates.
- Dose Rates coming from line used for leak test
- Recommendation was made to decay system instead of flush system.

Elevated Dose Rates in Waste Gas System

- Un-posted Radiation Area found on 609' in S. Waste Gas Compressor Room during routine surveys
- The small heat exchanger on gas compressor found reading 30 mR/hr on contact and 8 mR/hr at 30 cm.

Elevated Dose Rates in Waste Gas System

- No air sample needed to get isotopic on waste gas
- Gamma Spectrum provided on next slide nearly matched composite sample of resin taken for resin characterization.

Elevated Dose Rates in Waste Gas System

Comments:

0.2604 grams of resin from the SRST sluice performed on 12-10-2014.

Efficiency File: 8_ResinVial_1.Clb

Efficiency Desc: RP Detector #8 Resin Vial on Jig

Library: General.lib

| Nuclide | Activity uCi/gm | Error % |
|---------|--------------------|------------|
| Be-7 | 1.298E+00 | 2.35 |
| Mn-54 | 1.275E+00 | 0.57 |
| Co-57 | 7.185E-02 | 2.68 |
| Co-58 | 1.689E+00 | 0.47 |
| Co-60 | 5.123E+00 | 0.19 |
| Zn-65 | 5.587E-02 | 16.54 |
| Zr-95 | 7.471E-02 | 6.00 |
| Nb-95 | 1.282E-01 | 2.53 |
| Ag-110m | 4.037E-02 | 11.78 |
| Sn-113 | 3.673E-02 | 11.44 |
| Sb-124 | 7.499E-03 | 16.32 |
| Cs-134 | 3.872E+00 | 0.25 |
| Cs-137 | 3.360E+00 | 0.29 |
| Sb-125 | 6.310E-01 | 2.13 |

Total

1.766E+01

PAGEBREAK

1.766E+01

DC Cook Nuclear Power Plant

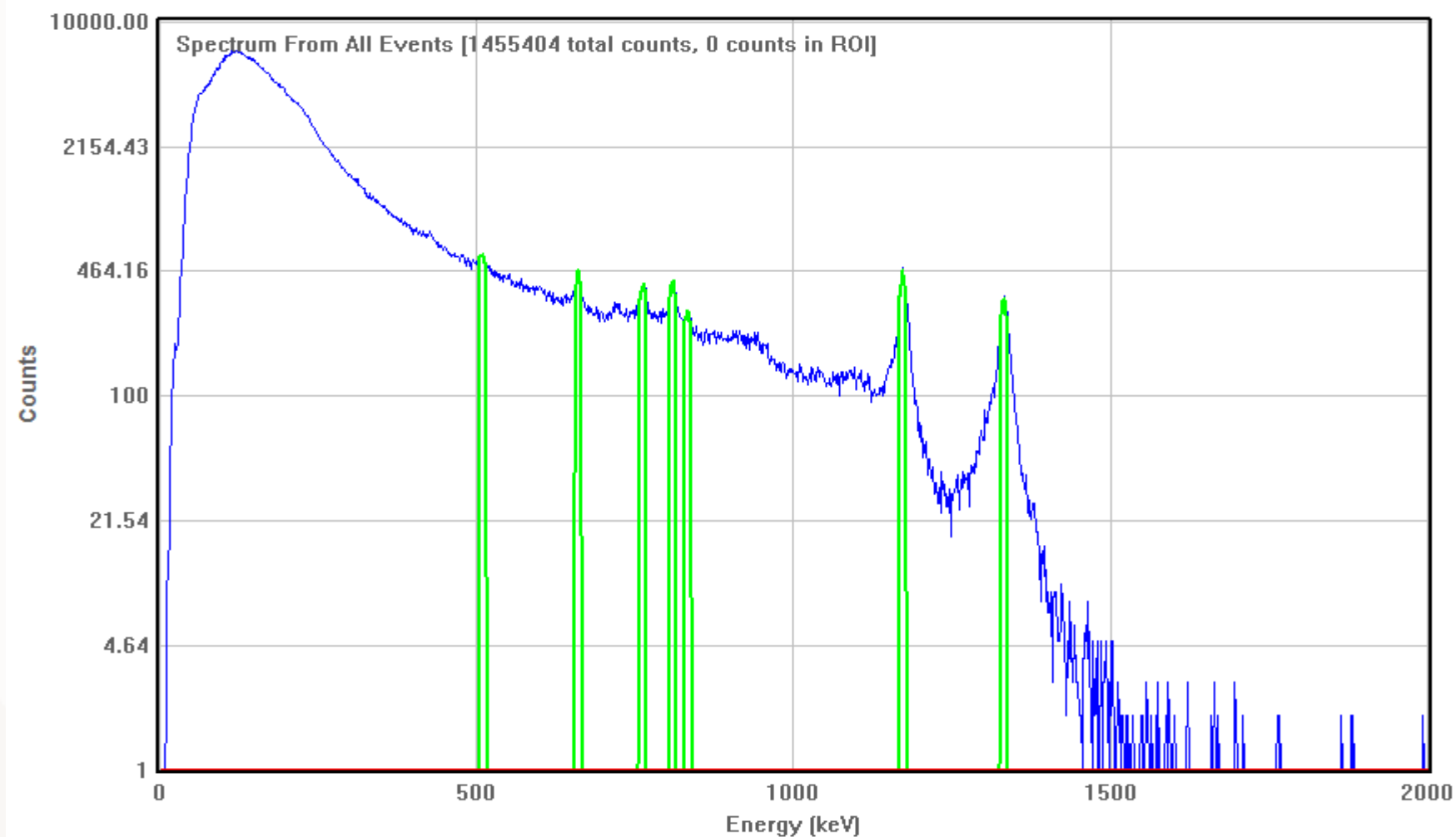
CHEM/RP/ENV Department

Description: Unit#12 SRST resin sample sluiced on 12-10-14

RWP: 2014-1012

*H₃ = 1.05 uCi/cc or
1.311 uCi/g*

Elevated Dose Rates in Waste Gas System – S. Waste Gas Compressor



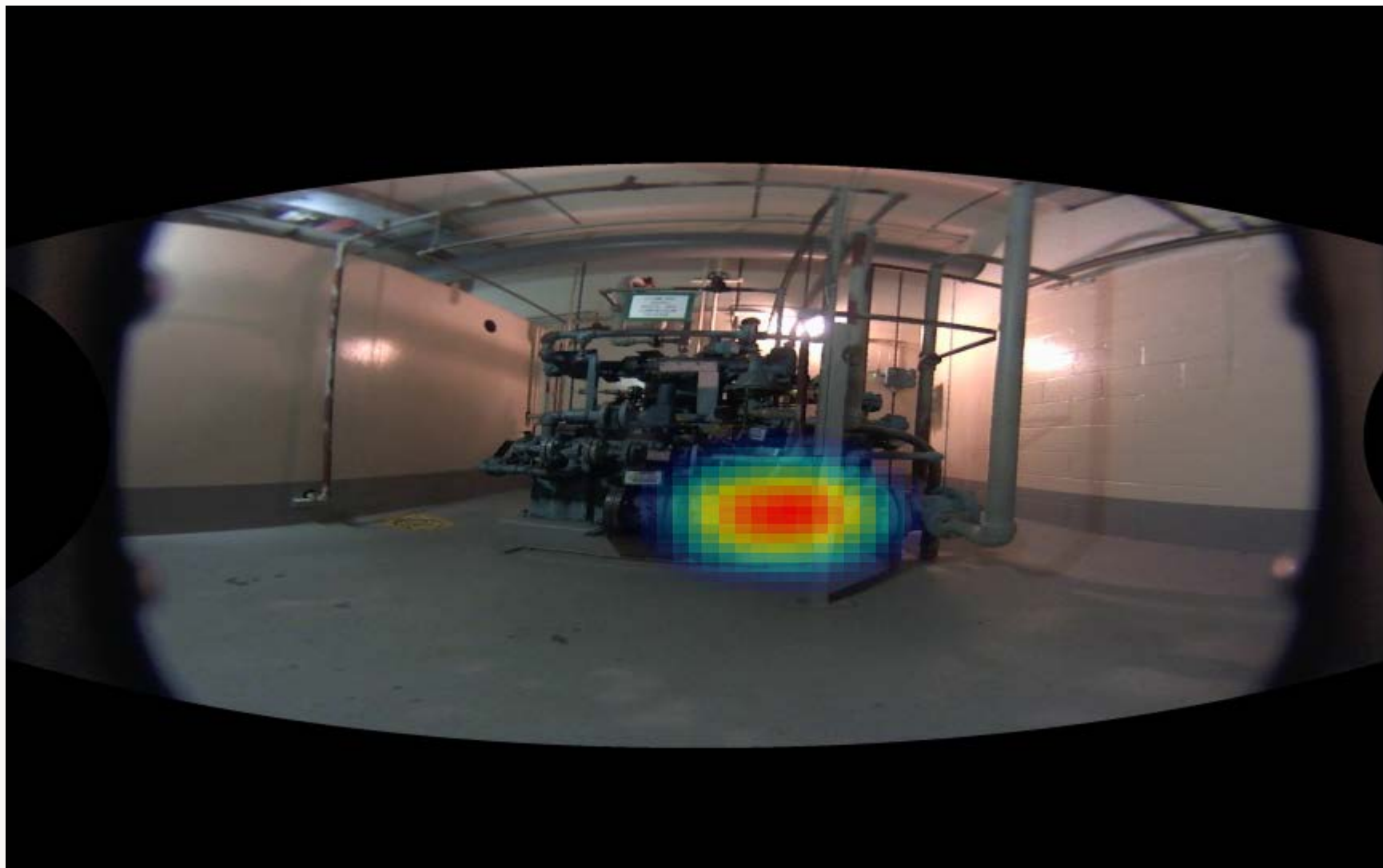
S. Waste Gas Compressor:

Co-58, Co-60, Cs-137, Mn-54, Nb-95

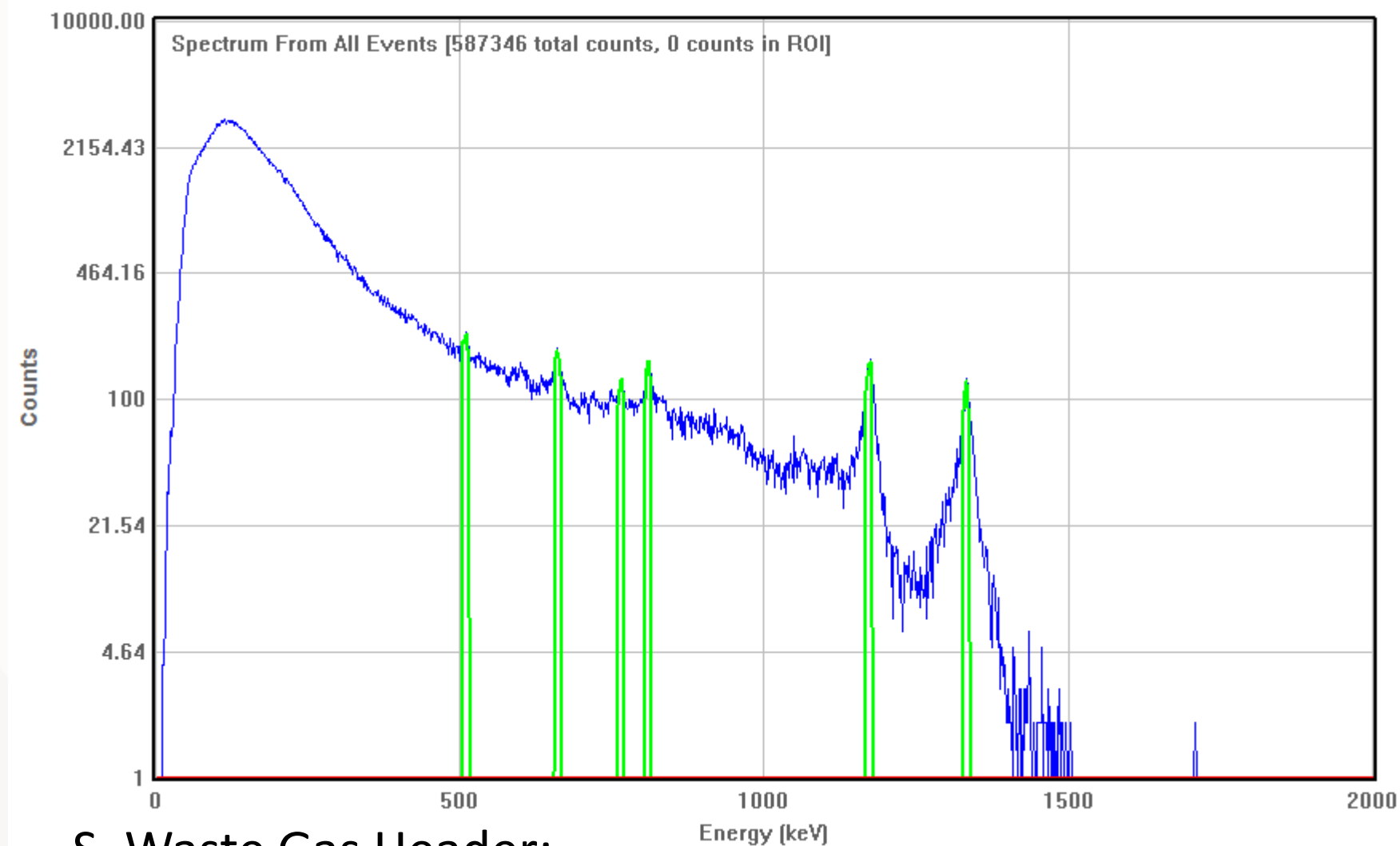
Czt: 1mR/hr. Ro20 @ CZT: 0.8mR/hr

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Elevated Dose Rates in Waste Gas System – S. Waste Gas Compressor

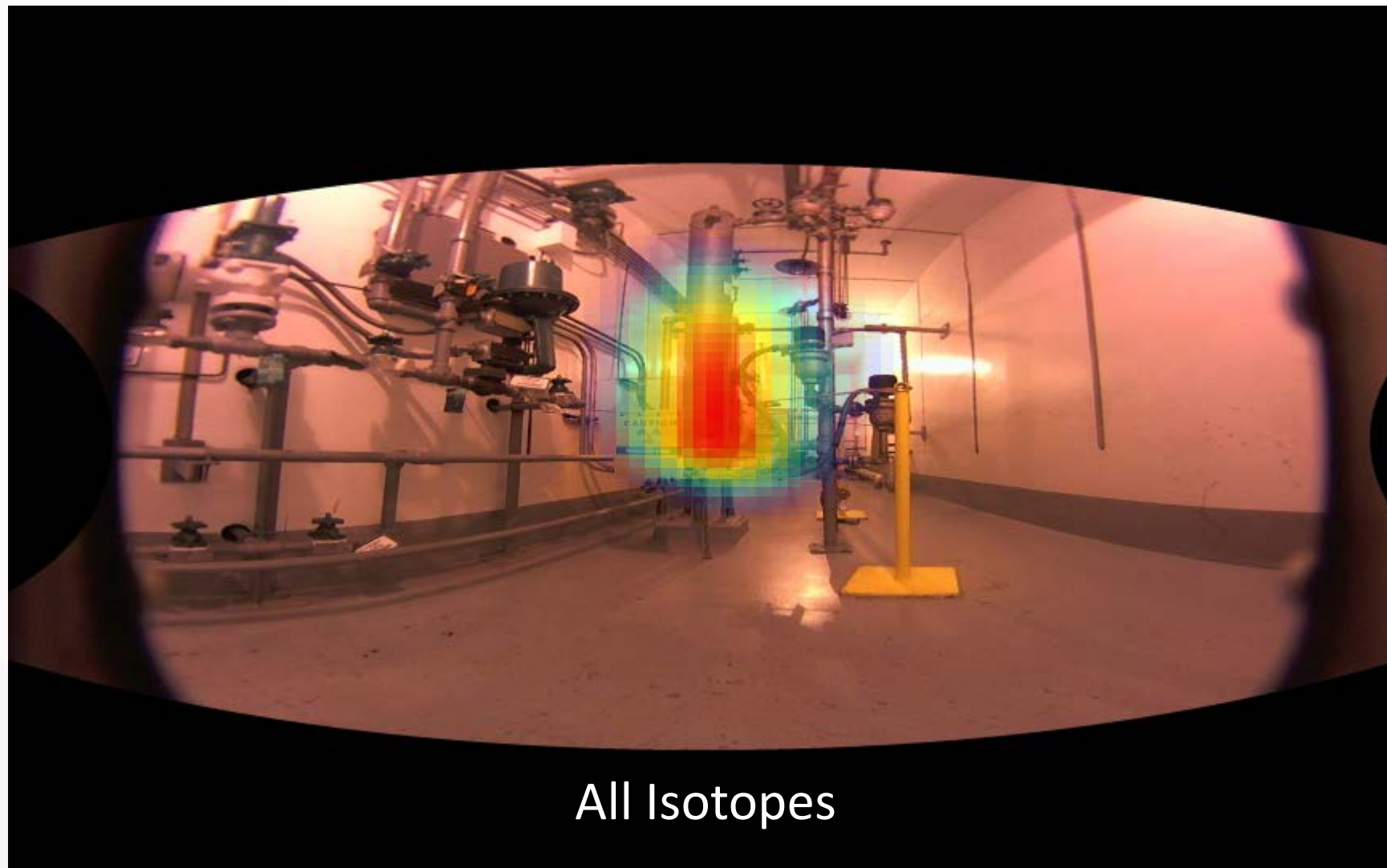


Elevated Dose Rates in Waste Gas System – S. Waste Gas Header



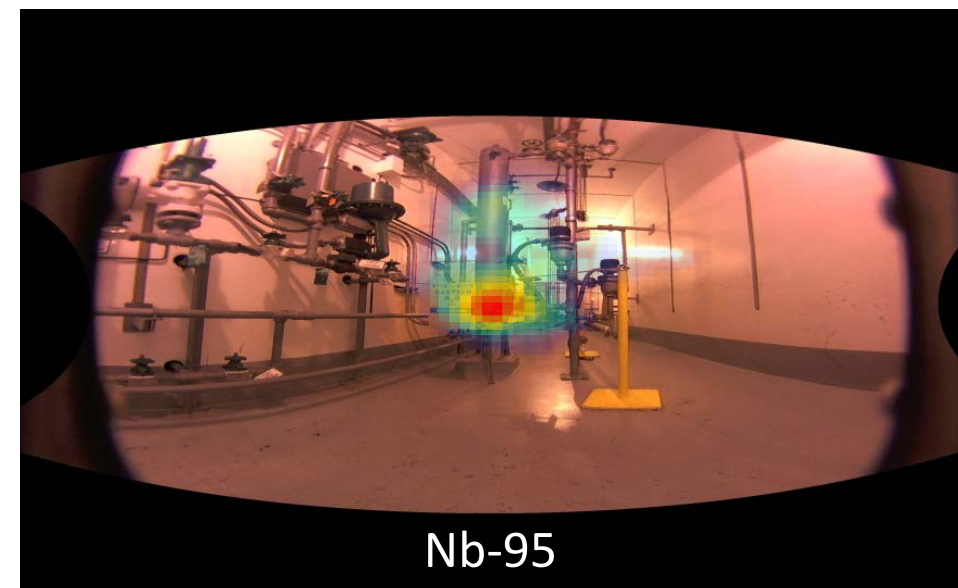
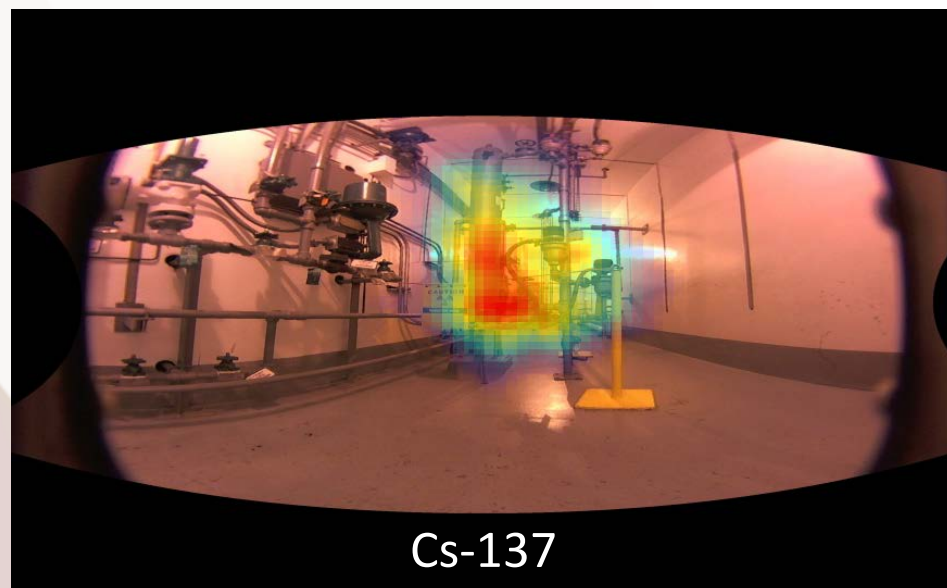
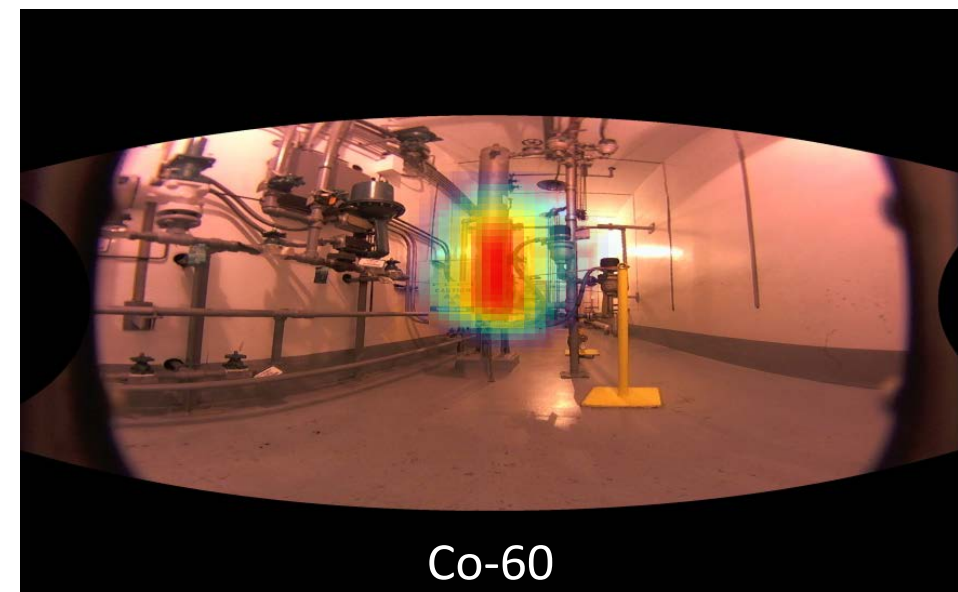
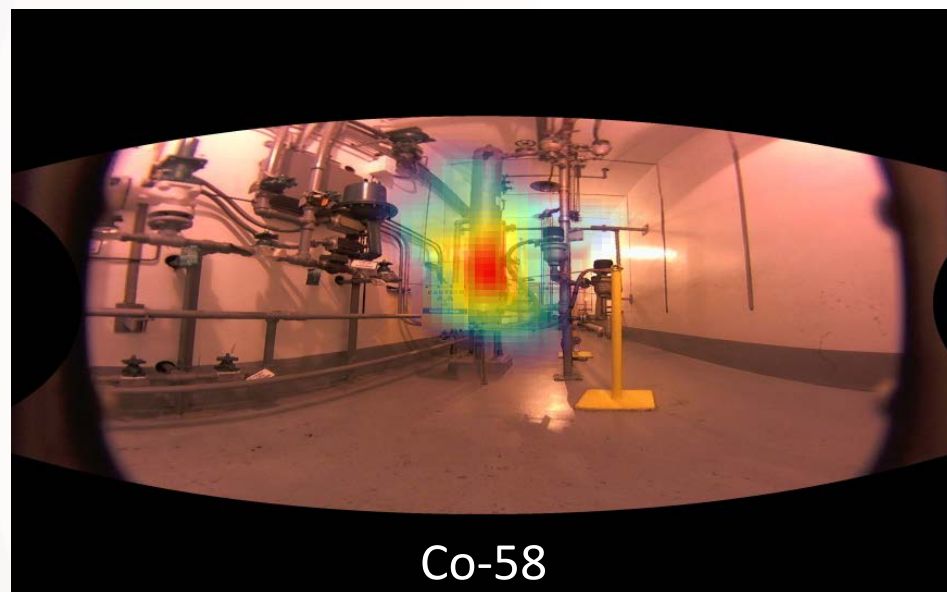
S. Waste Gas Header:
Co-58, Co-60, Cs-137, Nb-95

Elevated Dose Rates in Waste Gas System – S. Waste Gas Header



All Isotopes

Elevated Dose Rates in Waste Gas System – S. Waste Gas Header



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Elevated Dose Rates in Waste Gas System

- When the spent resin storage tank was filled water solid due to clogged resin, the vent path allowed water to enter the plant vent header.
- This water cleared out particles entrained in the piping and flowed down to the drain tank.
- The gas / vapor with the radioactive particles was drawn into the south compressor suction.

Questions?



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