

## RI - DNMS Licensee Event Report Disposition

Licensee: INCA - Fairfax

Event Description: Cesium-137 leaked from its container.

7

License No: <u>45-1728-DIC</u>	Docket No: <u>0301-2235</u>	LER-RI: <u>2009-004</u>
Event Date: <u>01/08/09</u>	Report Date: <u>03/03/09</u>	HQ Ops Event #: _____

1. REPORTING REQUIREMENT

<input type="checkbox"/> 10 CFR 20.1906 Package Contamination	<input type="checkbox"/> 10 CFR 30.50 Report
<input type="checkbox"/> 10 CFR 20.2201 Theft or Loss	<input type="checkbox"/> 10 CFR 35.3045 Medical Event
<input checked="" type="checkbox"/> 10 CFR 20.2203 30 Day Report	<input type="checkbox"/> License Condition
<input type="checkbox"/> Other _____	

2. REGIONAL RESPONSE

<input type="checkbox"/> Immediate Site Inspection	Inspector/Date	<u>McFinley/03/12/09</u>
<input type="checkbox"/> Special Inspection	Inspector/Date	
<input type="checkbox"/> Telephone Inquiry	Inspector/Date	
<input type="checkbox"/> Preliminary Notification/Report	<input type="checkbox"/> Daily Report	
<input checked="" type="checkbox"/> Information Entered in RI Log	<input checked="" type="checkbox"/> Review at Next Inspection	
<input type="checkbox"/> Report Referred To: _____		

3. REPORT EVALUATION

<input checked="" type="checkbox"/> Description of Event	<input checked="" type="checkbox"/> Corrective Actions
<input checked="" type="checkbox"/> Levels of RAM Involved	<input checked="" type="checkbox"/> Calculations Adequate
<input checked="" type="checkbox"/> Cause of Event	<input type="checkbox"/> Additional Information Requested from Licensee

4. MANAGEMENT DIRECTIVE 8.3 EVALUATION

<input type="checkbox"/> Release w/Exposure > Limits	<input type="checkbox"/> Deliberate Misuse w/Exposure > Limits
<input type="checkbox"/> Repeated Inadequate Control	<input type="checkbox"/> Pkging Failure > 10 rads/hr or Contamination > 1000x Limits
<input type="checkbox"/> Exposure 5x Limits	<input type="checkbox"/> Large # Indivs w/Exp > Limits or Medical Deterministic Effects
<input type="checkbox"/> Potential Fatality	<input type="checkbox"/> Unique Circumstances or Safeguards Concerns
<input type="checkbox"/> If any of the above are involved: Considered Need for IIT	<input type="checkbox"/> Considered Need for AIT
Decision/Made By/Date: <u>NA</u>	

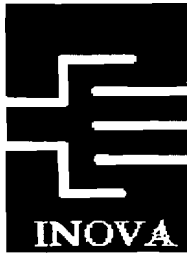
5. MANAGEMENT DIRECTIVE 8.10 EVALUATION (additional evaluation for medical events only)

<input type="checkbox"/> Timeliness - Inspection Meets Requirements (5 days for overdose 110 days for underdose)
<input type="checkbox"/> Medical Consultant Used - Name of Consultant/Date of Report: <u>NA</u>
<input type="checkbox"/> Medical Consultant Determined Event Directly Contributed to Fatality
<input type="checkbox"/> Device Failure with Possible Adverse Generic Implications
<input type="checkbox"/> HQ or Contractor Support Required to Evaluate Consequences

6. SPECIAL INSTRUCTIONS OR COMMENTS

\_\_\_\_\_

<input type="checkbox"/> Non-Public	Inspector Signature: <u>Richard D. McFinley</u>	Date: <u>3/09/09</u>
<input checked="" type="checkbox"/> Public-SUNSI REVIEW COMPLETE	Branch Chief Initials: <u>JJM</u>	Date: <u>3/12/09</u>



**Inova**  
**Health System**

A Tradition of Innovative Caring

**Medical Physics &  
Radiation Safety**  
**703 776-3705 (p) 2743 (f)**

**TO: RECORD**  
**FROM: DIRECTOR, MEDICAL PHYSICS**  
**DATE: 3 March 2009**  
**SUBJECT: LEAKING CHECK SOURCE in High Dose Rate After loader  
(HDR) Room 8 JAN 09**

- 1 **ISSUE:** On 8 January, 2009, a small radioactive Cesium-137 (Cs-137) check source was discovered to have leaked from its container. Upon discovery, clean up actions were immediately taken and the area was made safe. No personnel were contaminated and no personnel received any significant radiation exposure. This report will document the results of the cleanup effort and post incident evaluation.
- 2 **BACKGROUND:** On 8 Jan 09 at 10.00, the Radiation Safety Officer (MT) was called to the HDR (high dose rate after loader) room by a Staff Physicist (CE) (attachment 1). The physicist explained there was an unusually high radiation reading at the physics port in the treatment room. This port is a PVC plastic pipe that runs from the floor of the HDR control room through a U-shaped path to the floor in the treatment room. The purpose of the port is to allow passage of electronic cables between the two rooms to make calibration measurements, without allowing the escape of radiation during treatments. Unexpectedly, the port contained water, apparently left by a leak from the sink in the same room on 12/29/08. The RSO confirmed the presence of radioactivity and isolated the area from personnel. The measured radiation fluence was very low: approximately 100 MicroREM per hour at the opening to the port. The RSO confirmed that a small Cs-137 check source, used to check the response of the in-room radiation detector, and normally stored in the physics port for safety and security reasons, was in the water. He took a sample of the water and did spectroscopic analysis to confirm that the radioactive isotope was indeed Cs-137. All involved personnel were checked for contamination and none was discovered.
- 3 **DISCUSSION:** No one was contaminated and no one received any significant dose from being in the HDR room or control room. This incident did not meet the reporting requirements of the NRC title 10



**Inova  
Health System**

A Tradition of Innovative Caring

**Medical Physics &  
Radiation Safety  
703 776-3705 (p) 2743 (f)**

parts 20.2202 and 20.2203. The RSO contacted hospital management telephoned the NRC and the Virginia Department of Environmental Health to provide information about the incident (attachments 2 & 3).

**4 ACTIONS:**

**a. Waste:**

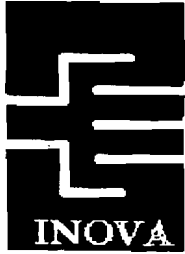
- i. The water was removed from the port by Radiation Safety Health Physicist and allowed to evaporate. The residual contamination left in the plastic container was consolidated with the other materials used to decontaminate the physics tube (attachment 4). The results of the contamination of the waste are provided as an attachment (5), to this report. The sum contamination measured was 2.853 micro-Curies of Cesium-137.

**. b. Leaking Source: (attachment 6)**

- i. This was a very old source, and unlike any other in the Inova system. Current sources are imbedded in a plastic matrix that is reportedly waterproof. This check source must have been made in which the radioactive material was placed a cavity, then sealed with glue. The check source was determined to be a pocket dosimeter (ionization chamber) response source. On the check source was an identifying label stating the source was Cs-137 and 90 micro-Curies in strength, but no date of calibration. Post measurements of this source in a dose calibrator, measured 43 micro-Curies. Cesium has a half life of 30 years, so it can be assumed the source has been in the system for one half life.
- ii. After drying, HP personnel encased the source in epoxy. There is no loose surface contamination after this coating was applied.

**c. Clean up: (attachment 7)**

- i. 9 January 2009: Post discovery of the high exposure rates, Health Physics determined the extent of the spread of contamination. The physics port on the control console side was not contaminated. There was minor contamination around the physics port entrance in the HDR patient treat room. This contamination was determined to be due to water spillage when the wet check source was taken out of the physics tube by the Medical Physicist who wanted to test the independent room radiation detector. The contamination was reduced to background by numerous



**Inova  
Health System**

A Tradition of Innovative Caring


**Medical Physics &  
Radiation Safety  
703 776-3705 (p) 2743 (f)**

cleanings of the floor with RadClean and housecleaner 409. As mentioned above, the contaminated water was removed by Health Physics. The removal was accomplished by siphoning out the water with a large bore syringe. All HP personnel involved in the evolution wore plastic arm covers and two sets of gloves. It took thirty minutes to remove the water from the physics tube.

- ii. 12 & 13 February 2009. After the physics port was allowed to completely dry, Health Physics personnel performed decontamination of the full length of the tube port. After five iterations of decontamination actions, the contamination levels were reduced to background. There remains one area slightly above background where there is a saw cut in the joint of a PVC pipe, approximately five centimeters below the opening of the physics port on the patient side. This area was evaluated (attachment 5) and the dose rate is similar to background and the activity measured was 0.005 micro-Curies. There is no loose contamination measured post cleanup (attachment 6).

**5 RECOMMENDATIONS and ACTIONS:**

- a. The Radiation Safety Officer has conducted a review of all radioactive sources in the hospital. All sources considered to be not useful, or not sufficiently robust, have been taken out of active service and placed in the inactive category. These sources, along with the one in the current incident, will be disposed of when a shipper and disposal site can be arranged.
- b. This report will be provided to the NRC and the State.

  
Michael Taylor M.S.  
Director, Medical Physics  
Radiation Safety Officer

  
Michael Taylor M.S.

## Report to Mike Taylor

About events on 1/8/2009 in HDR room. On this day we had schedule 5 patients for treatment. Morning QA went uneventful. All data were OK. When we survey room after treating first patient we noticed that readings were unusually high (about 88microrem/hr). While treating the second patient we noticed that following (see below) it was around 9:30AM, we were told that we are safe to treat the patient and we proceeded with our schedule. Service call was placed to Nucletron and engineer is scheduled to come tomorrow 1/9/2009 to fix the problems.

1. Radiation detector light on the HDR computer console flashed on and off intermittently while Ir source was in safe.
2. Nucletron was called and notified of the flashing light.
3. Nucletron suggested that the Physical detector on the afterloader device was unusually sensitive.
4. We decided to pull the check source from the HDR treatment room floor and to put it close to the radiation detector on the afterloader to see if this would also stimulate the radiation detector light.
5. When the Source was pulled from the floor, it brought with it a puddle of water.
6. The puddle of water was surveyed and determined to be radioactive.
7. Radiation Safety was notified.
8. The puddle of water was clean up with absorbent tissue, put in a bag along with the check source and put in the hot lab containment area.

Charlotta Efros and Don Anderson 11812009

## Taylor, Michael

---

**From:** Taylor, Michael  
**Sent:** Thursday, January 08, 2009 3:11 PM  
**To:** Cohen, Colleen  
**Cc:** Turner, Keith; Tonnesen, Glenn; Hetelekidis, Stella; Taylor, Michael  
**Subject:** SOURCE LEAK IN RAD ONC

Colleen

Today, 8 Jan 09 at 10:00, I was called to the HDR (high dose rate after loader) room by a Staff Physicist (CE). The Physicist explained there was an unusually high radiation rate reading at the physics port in the treatment room. This port is a PVC plastic connection in a U shape, which goes under the ground and connects the control console and the treatment room. It's shaped like the "J" valve you have under your kitchen sink. The purpose of the port is to allow physics to pass electronic cables between the two rooms to make calibration measurements. Unfortunately, like the kitchen sink, our port was full of water.

I confirmed the Physicist measurements and isolated the area from personnel. The measured radiation rates were very low, in the microREM per hour. I discovered the small radioactive check source, used to check the response of the in room detector, had been in the water. I assumed there had been a leak of the source to the water. I took a sample of the water and perform isotope spectroscopy to confirm the isotope, Cesium 137. The result of the spectroscopy analysis confirmed my suspicion the isotope was Cesium 137.

No one was contaminated and no one received any significant dose from being in the HDR room. This incident did not meet the reporting requirements of the NRC title 10 parts 20.2202 and 2203. I did call the NRC and the State to provide the information (in case there was a regulation I had not considered). Both Agencies confirmed no report was required, but were thankful to receive the information. The State suggested I send a report to the NRC and cc the State.

The water has been drained from the port and is safely contained in plastic bottles. The cause of the water was traced to a leaking sink in the HDR a week ago that spillage must have extended to the control console port entrance. The small check source is supposed to be imbedded in a plastic matrix which should make it waterproof. This was a very old source and must have been made by a different process as our check sources available today (or for the last 30 years). There are no other sources like this in the system.

I will put together a report of the event and submit it for review.

Mike

Michael Taylor  
Director Medical Physics  
Inova Fairfax Hospital  
3300 Gallows Rd, Falls Church VA 22042  
703.776.3705  
[michael.taylor@inova.org](mailto:michael.taylor@inova.org)

**Taylor, Michael**

---

**From:** Welling, Mike (VDH) [Mike.Welling@vdh.virginia.gov]  
**Sent:** Friday, January 16, 2009 8:23 AM  
**To:** Taylor, Michael  
**Subject:** Re: Report on leaking check source

Yes, please have it on letterhead and signed to make it official, thanks.

---

**From:** Taylor, Michael  
**To:** Welling, Mike (VDH)  
**Sent:** Fri Jan 16 08:20:51 2009  
**Subject:** Report on leaking check source

Mike  
Attached is my report for the leaking check source. Do you want it sent in paper?  
mike

Michael Taylor  
Director Medical Physics  
Inova Fairfax Hospital  
3300 Gallows Rd, Falls Church VA 22042  
703.776.3705  
[michael.taylor@inova.org](mailto:michael.taylor@inova.org)

## Work Order Details

Create a Work Order | Query for Work Orders



---

### Work Order Details

<b>Name (Give first and last name):</b>	Karole Nielsen
<b>Department Number / Cost Code:</b>	RADIATION ONCOLOGY
<b>WO Number:</b>	627892
<b>Location Give Building, Floor, Room Number:</b>	HDR Room
<b>Work Description (Work you would like done):</b>	Leakng sink in HDR Room
<b>Date Created:</b>	12/29/2008
<b>Assignment:</b>	

---

[Add Another Work Order](#)



**Taylor, Michael**

---

**From:** Cohen, Colleen  
**Sent:** Saturday, January 24, 2009 6:07 PM  
**To:** Taylor, Michael  
**Subject:** RE: Question

That's good news. Thanks for using such excellent judgment. I really appreciate you!

---

**From:** Taylor, Michael  
**Sent:** Friday, January 16, 2009 1:10 PM  
**To:** Kang, Dong; Mendez, Jose; Tonnesen, Glenn; Lamark, Richard; Turner, Keith; George, James; He, Shanjin; Eros, Charlotta; Anderson, Don; Cohen, Colleen  
**Subject:** FW: Question

Note the highlight Mike

---

**From:** Sandra Gabriel [mailto:Sandra.Gabriel@nrc.gov]  
**Sent:** Friday, January 16, 2009 1:01 PM  
**To:** Taylor, Michael  
**Subject:** RE: Question

Mike:

Thank you. If you wish, you may send a formal copy, though there is no reporting requirement. Additional information of interest to the NRC will be:

- a) description of the original source (prior to the event--source activity/description/labeling--and after the event,
- b) description of the way in which the source was mounted on wood and stored in the physics port,
- b) your evaluation of the quantity and concentration of Cs-137 in the recovered water,
- c) survey results to confirm that there was no spread of contamination, and no contamination remains,
- d) time course of the event, including what you believed happened between the time of the leak to the time the event was identified,
- e) exactly how the event was identified.

Other potential reporting requirements to acknowledge might be sealed source contamination under 10 CFR 35.67 or the non-part 35 sealed source license condition. Confirmation of low microcurie quantity source activity would likely confirm that this was an exempt-quantity source, with no requirement to leak test. My current understanding is that it is necessary to report contamination only for sealed sources for which leak-testing is required.

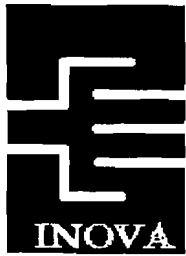
Based on your report of this "event," I may be able to justify doing a scheduled inspection within the next few weeks, rather than an unannounced inspection.

I have the day off today and Monday is a holiday, so I'll be back in the office on Tuesday. Have a nice weekend.

Sandy

---

I



**Inova  
Health System**

A Tradition of Innovative Caring

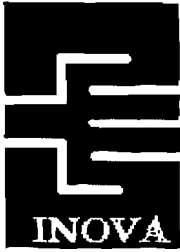
**Medical Physics &  
Radiation Safety**  
703 776-33705 (p) 2743 (f)

the spectroscopy analysis confirmed the isotope was Cesium 137. The source was normally stored in the physics port for safety and security reasons.

- 3 DISCUSSION: No one was contaminated and no one received any significant dose from being in the HDR room. This incident did not meet the reporting requirements of the NRC title 10 parts 20.2202 and 2203. The RSO called the NRC and the State to provide the information about the incident. Both Agencies confirmed no report was required, but were thankful to receive the information. The State suggested I send a report to the NRC and cc the State. The water has been removed from the port and is safely contained in a plastic bottle. The source of the water was traced to a leaking sink in the HDR on 12/29/08 and the spillage extended to the control console port entrance. The small check source is supposed to be imbedded in a plastic matrix which should make it waterproof. This was a very old source and must have been made by a different process as our check sources available today (or for the last 30 years). There are no other sources like this in the system.

**4 RECOMMENDATIONS and ACTIONS:**

- a. A review will be conducted by the Radiation Safety Officer on all radioactive sources in the hospital. Any source considered not be useful or not constructed to be used in a robust fashion. will be taken out of active service and placed in the inactive category. These sources will be properly disposed when a shipper and disposal site can be arranged.
- b. The waste from the spill will be contained in the hospital waste holding area. The wet materials will be dried out and repackaged for disposal.
- c. The physics port is contained and labeled with appropriate warning signage. The port will be allowed to dry and decontamination of the port



**Inova  
Health System**

A Tradition of Innovative Caring

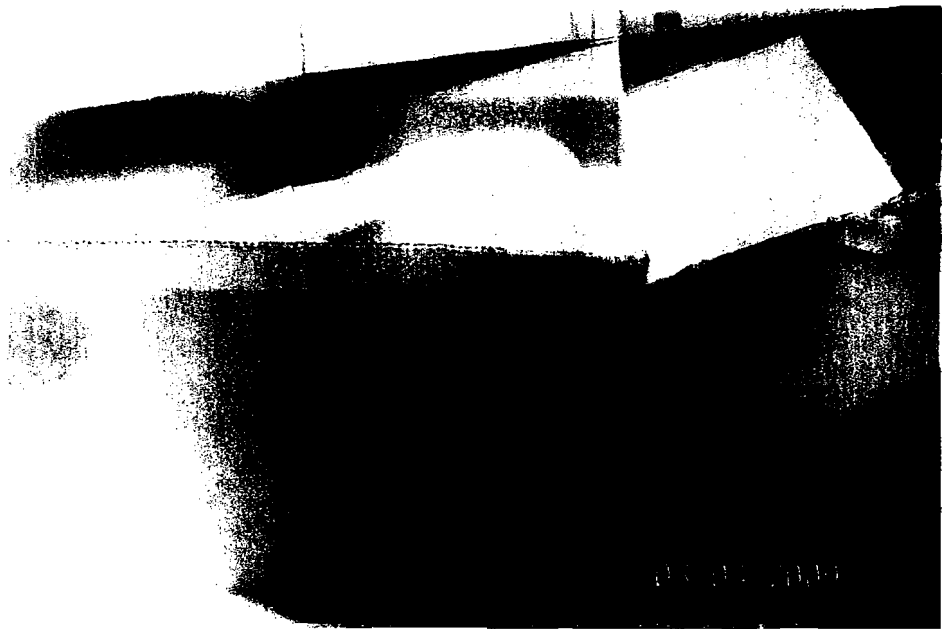
**Medical Physics &  
Radiation Safety  
703 776-33705 (p) 2743 (f)**

will be attempted. After removal of the water and initial decontamination of the floor area, the ambient radiation levels of the port area were the same as before the incident.

A handwritten signature in black ink, appearing to read 'Michael Taylor'.

Michael Taylor M.S

Director Medical Physics & RSO



Total Cleanup  
Materials used

ATM 1/1/11



08-Jan-09

Instrument:

ATOM LAB 950, 2x2 NaI (TI) inch well counter, 2x2 NaI (TI) inch thyroid

Report by:

Michael Taylor, RSO

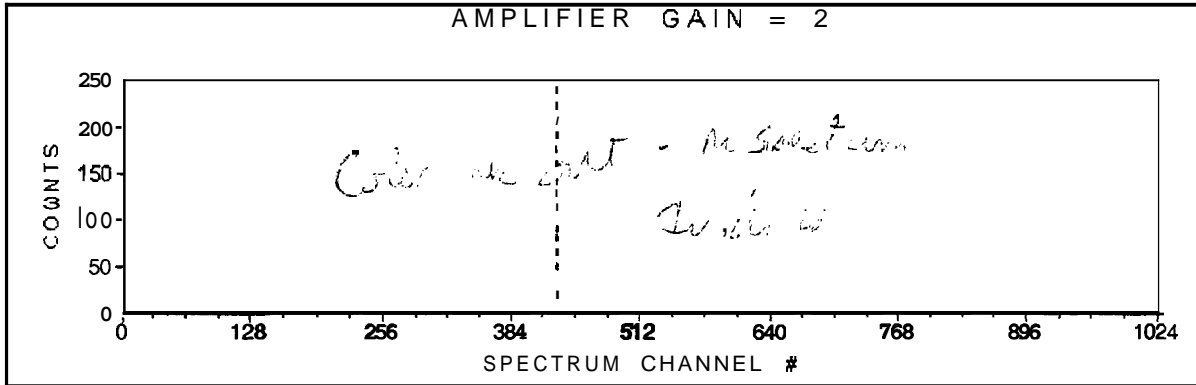
The purpose of this report is to document the contamination levels of the materials involved in the clean up of the leaking Cesium 137 check source as discovered on 8 January 2009.

Well Counter wipe test results

10 uCi Cs137 button source calibrated 1Feb00	Background	Corrected count	Activity To Date	Activity per count uCi/CPM	Measured Maximum sample	Corrected count	Activity uCi
CPM							
85641	44	85601	8.145	9.52E-05			
Contaminated water					2601	2561	0.244

CS Button  
 count: 2000  
 well counter

**: Analysis Report**



spectrum acquired on Thursday, January 08, 2009 at 01:13 PM

11.55

**Countina Parameters**

Isotope: Cs-137                      Detector: Well  
 Gain: 2                                  Count Time (sec): 20

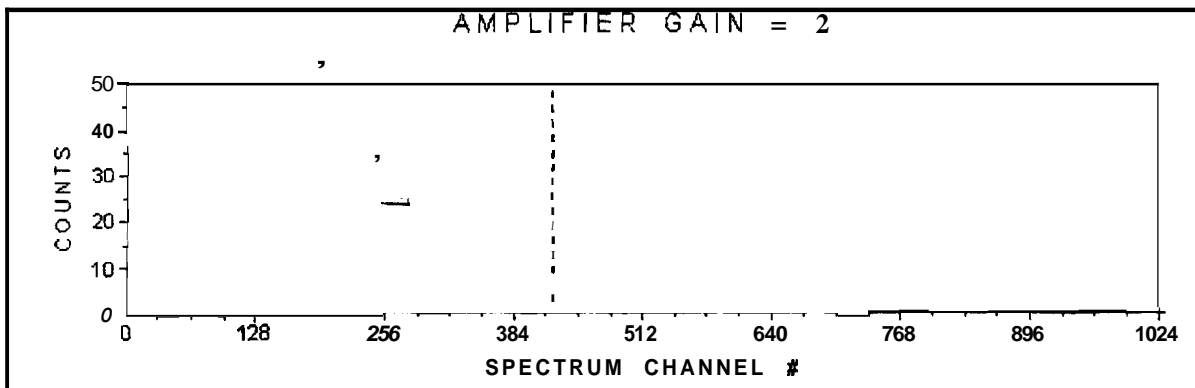
**ROI Statistics**

ROI #	ROI (kev)	ROI COUNTS	ROI CPM	CURSOR (kev)	CURSOR COUNTS	CURSOR CPM
0 1	561 to 759	28547	<u>85641</u>	667	213	639

2101 peak

Water returned from well.

### Spectrum Analysis Report



Spectrum acquired on Thursday, January 08, 2009 at 01:04 PM

1145

#### Counting Parameters.

Isotope: Cs-137

Detector: Well

Gain: 2

Count Time (sec): 20

#### ROI Statistics

ROI #	ROI (kev)	ROI COUNTS	ROI CPM	CURSOR (kev)	CURSOR COUNTS	CURSOR CPM
0 1	561 to 759	867	2601	655	37	111

20-Jan-09

Instrument: ATOM LAB 950, 2x2 NaI (TI) inch well counter, 2x2 NaI (TI) inch thyroid

Report by: Michael Taylor, RSO

The purpose of this report is to document the contamination levels of the materials involved in the clean up of the leaking Cesium 137 check source as discovered on 8 January 2009.

**Thyroid counter evaluation of leaking check source**

10 uCi Cs137 button source calibrated 1Feb00	Background	Corrected count	Activity To Date	Activity per count uCi/CPM
CPM				
15799	40	15759	8.117	0.000515

Measured Cs137 Check source	Corrected count	Activity uCi
46900	46860	24.136

Check source evaluation

**CRC DOSE CALIBRATOR MEASUREMENTS OF LEAKING CHECK SOURCE**

unit	mCi
CRC 7	44.55
CRC 15	

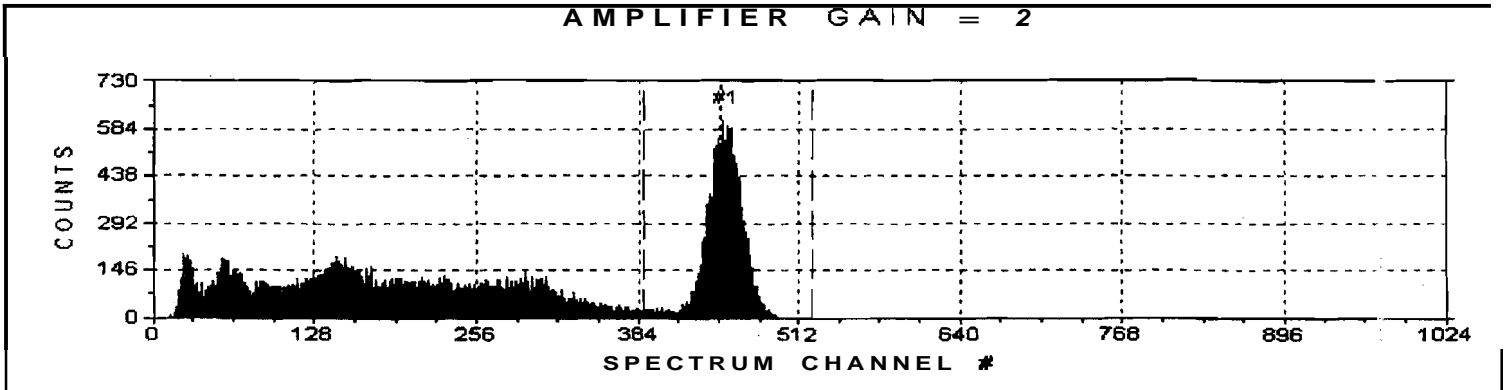


In Contact w/  
[unclear]  
Aperture

## Spectrum Analysis Report

102

AMPLIFIER GAIN = 2



Spectrum acquired on Tuesday, January 20, 2009 at 02:15 PM

### Counting Parameters

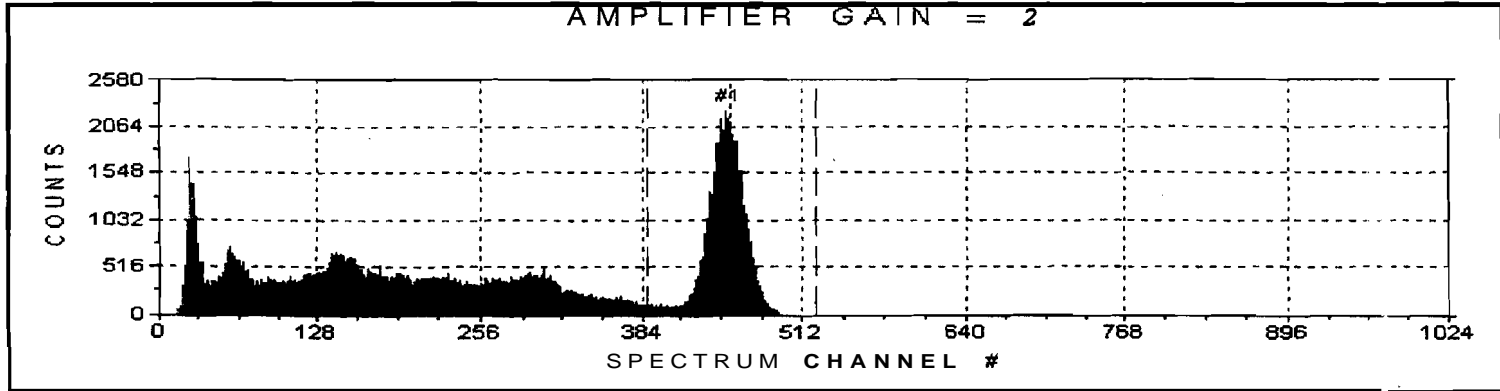
Isotope: Cs-137                      Detector: Probe  
Gain: 2                                  Count Time (sec): 60

### ROI Statistics

ROI #	ROI (kev)	ROI COUNTS	ROI CPM	CURSOR (kev)	CURSOR COUNTS	CURSOR CPM
• 1	560 to 761	46900	<u>46900</u>	652	632	632

Handwritten notes:  
 1. 2009  
 2. 12/20  
 They said Probe  
 after the  
 Probe

trum Analysis p



Spectrum acquired on Tuesday, January 20, 2009 at 02:04 PM

Counting P.

Isotope: Cs-137                      Detector: Probe  
 Gain: 2                                      Count Time (sec): 388

ROI Statistics

ROI #	ROI (kev)	ROI COUNTS	ROI CPM	CURSOR (kev)	CURSOR COUNTS	CURSOR CPM
• 1	560 to 761	102172	<u>15799</u>	661	2242	346

03-Mar-09

Instrument: ATOM LAB 950, 2x2 NaI (TI) inch well counter, 2x2 NaI (TI) inch thyroid detector, TDI # 205742, software ver 3.33

Report by: Michael Taylor, RSO

The purpose of this report is to document the contamination levels of the materials involved in the clean up of the leaking Cesium 137 check source as discovered on 8 January 2009.

Well Counter wipe test results

10 uCi Cs137 button source calibrated 1Feb00	Background	Corrected count	Activity To Date	Activity per count uCi/CPM	Measured Maximum wipe from Cs137 Check source	Corrected count	Activity uCi
CPM							
155188	36	155152	8.117	5.23E-05			
					PD holder side of check source	16	-20 -0.001
					Clockwise of above, one side	20	-16 -0.001
					Back of check source	20	-16 -0.001
					Clockwise of above! one side	12	-24 -0.001
					Radioactive Label ID area	48	12 0.001
					Endsof check source	24	-12 -0.001

	Measured Maximum wipe from lead pipe	Corrected count	Activity uCi
OD, outer casing of lead pipe	40	4	0.000
ID, inner sides of lead pipe	72	36	0.002

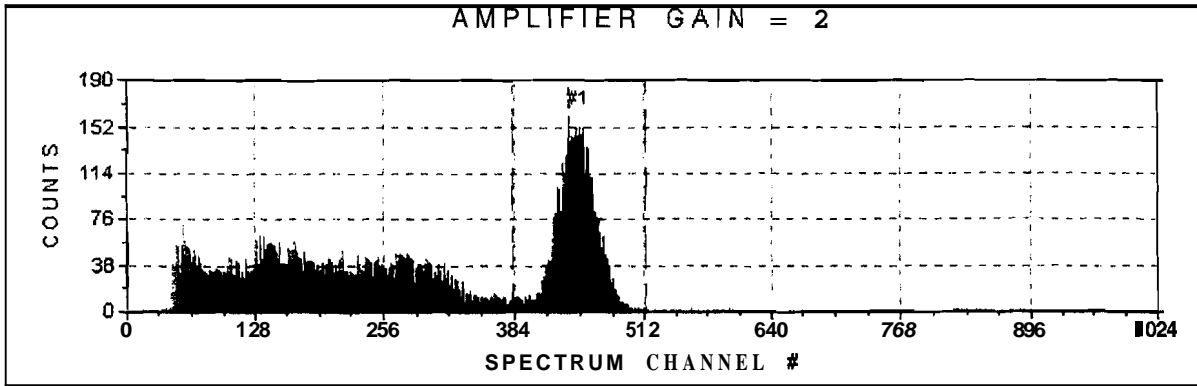
Thyroid Counter Evaluation of activity within waste containers

10 uCi Cs137 button source calibrated 1Feb00	Background	Corrected count	Activity To Date	Activity per count uCi/CPM	Measured Maximum wipe	Corrected count	Activity uCi
CPM							
25711	65	25646	8.155	0.000318			
					Plastic cylinder, absorbants for collection of water	4717	4652 1.479
					Plastic bucket, dried water & post 12 Feb 09 cleanup	4007	3942 1.253
					Plastic bag of initial discovery cleanup materials	157	92 0.029
					Electrometer signal wire	98	33 0.010
					ID of lead pipe	177	112 0.036
					OD of lead pipe	205	140 0.045

Sum waste activity uCi

Well 3.3/09  
Well Counter

## Spectrum Analysis Report



Spectrum acquired on Tuesday, March 03, 2009 at 04:11 PM

ti    amel

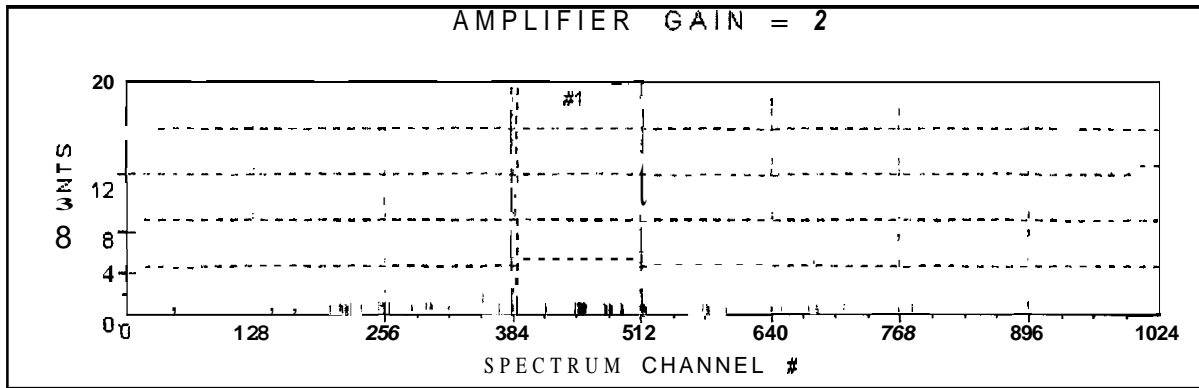
Isotope:	Cs-137	Detector:	Well
Gain:	2	Count Time (sec):	15

### ROI Statistics

ROI #	ROI (kev)	ROI COUNTS	ROI CPM	CURSOR (kev)	CURSOR COUNTS	CURSOR CPM
● 1	560 to 761	38797	<u>155188</u>	643	158	632

3/3/09  
BKWD  
Well

## Spectrum A I Report



spectrum acquired on Tuesday, March 03, 2009 at 04:36 PM

### Counting Parameters

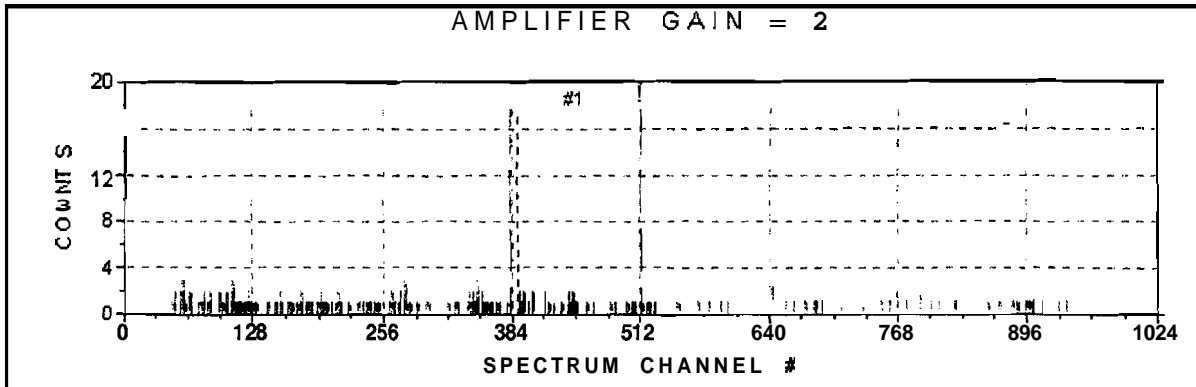
Isotope: Cs-137                      Detector: Well  
Gain: 2                                      Count Time (sec): 15

### ROI Statistics

ROI #	ROI (kev)	ROI COUNTS	ROI CPM	ROI (kev)	ROI COUNTS	ROI CPM
● 1	560 to 761	10	40	569	1	4

Leak Sample  
Test 3/03

## Spectrum Analysis Report



Spectrum acquired on Tuesday, March 03, 2009 at 02:59 PM

### Counting Parameters

Isotope: Cs-137                      Detector: Well  
Gain: 2                                  Count Time (sec): 60

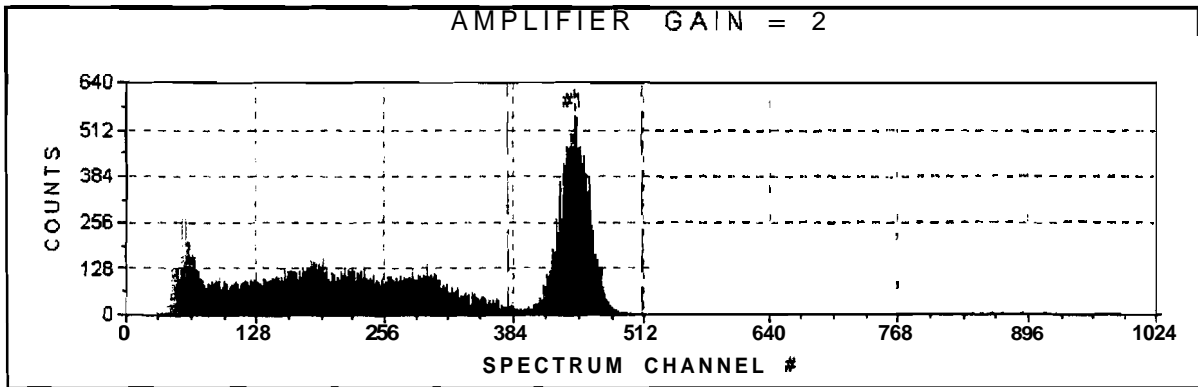
### ROI Statistics

ROI #	ROI (kev)	ROI COUNTS	ROI CPM	CURSOR (kev)	CURSOR COUNTS	CURSOR CPM
● 1	560 to 761	30	30	572	2	2

See spreadsheet  
for all sample  
results

Thyroid  
 10 mCi button  
 1 FEB 00 Cs,  
 3 MR 09 counter

## Spectrum Analysis Report



Spectrum acquired on Tuesday, March 03, 2009 at 04:09 PM

### Counting

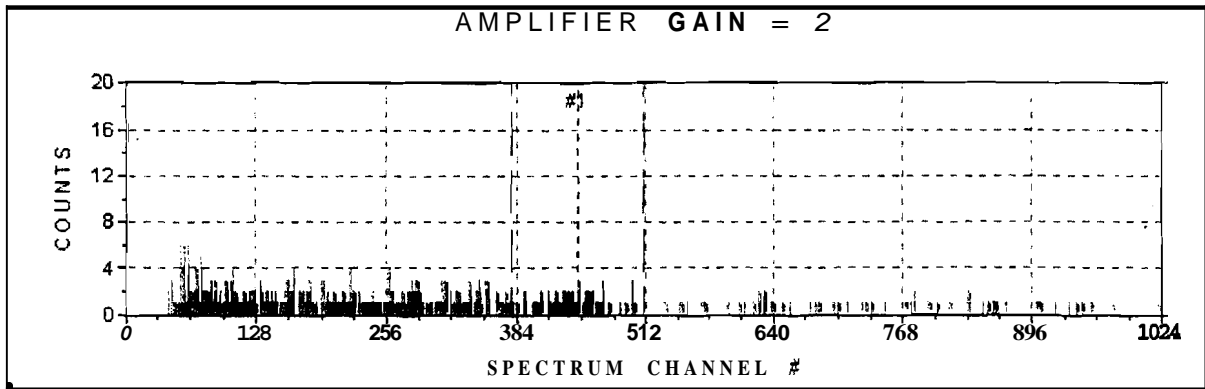
Isotope:	Cs-137	Detector:	Probe
Gain:	2	Count Time (sec):	60

### ROI Statistics

ROI #	ROI !kev!	ROI COUNTS	ROI CPM	CURSOR (kev)	CURSOR COUNTS	CURSOR CPM
● 1	561 to 760	25711	25711	661	552	552

Background  
Threshold Probe

## Spectrum Analysis Report



Spectrum acquired on Tuesday, March 03, 2009 at 04:32 PM

### Counting Parameters.

isotope: Cs-137                      Detector: Probe  
Gain: 2                                      Count Time (sec): 60

### ROI Statistics

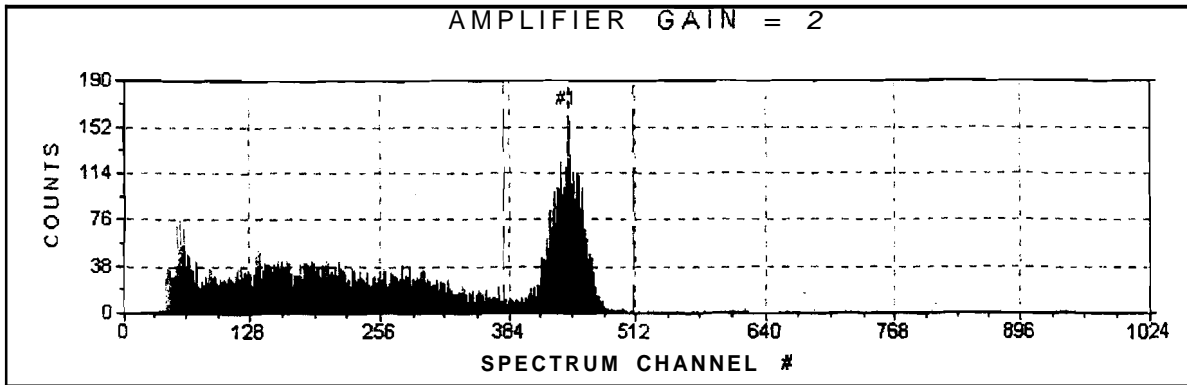
ROI #	ROI (kev)	COUNTS	CPM	ROI (kev)	COUNTS	CPM
● 1	561 to 760	65	65	661	3	3



*Absolut + Absolute Cycle*

*Thyroid Probe*

## Spectrum Analysis Report



Spectrum acquired on Tuesday, March 03, 2009 at 04:18 PM

### Counting Parameters

Isotope: Cs-137                      Detector: Probe  
Gain: 2                                      Count Time (sec): 60

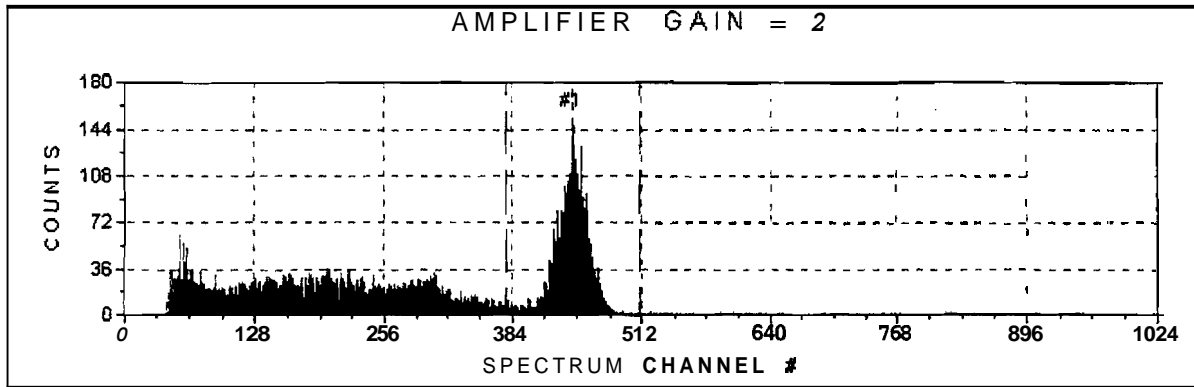
### ROI Statistics

ROI #	ROI (kev)	ROI COUNTS	ROI CPM	CURSOR (kev)	CURSOR COUNTS	CURSOR CPM
● 1	561 to 760	4717	4717	661	157	157

Dried water / Packet  
3/3/09

Thyroid Probe

## SI Analysis Report



Spectrum acquired on Tuesday, March 03, 2009 at 04:21 PM

### ti Parameters

isotope:	Cs-137	Detector:	Probe
Gain:	2	Count Time (sec):	60

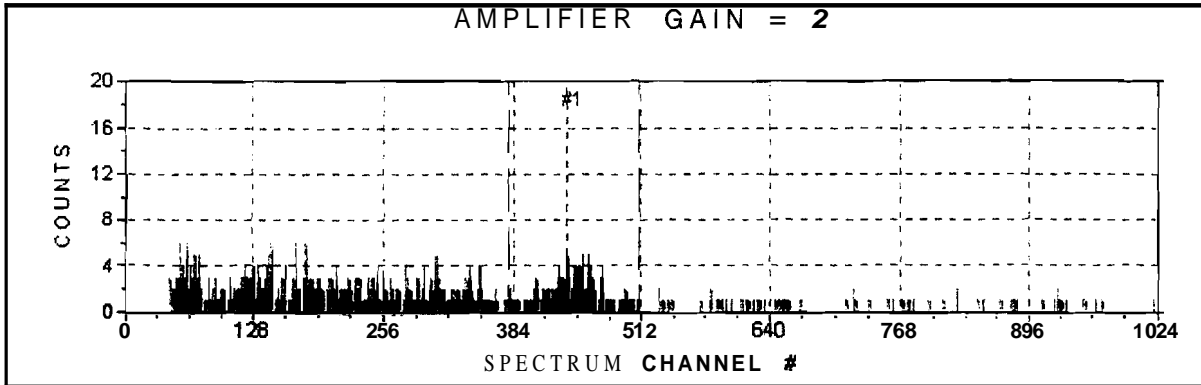
### ROI Statistics

ROI #	ROI (kev)	ROI COUNTS	ROI CPM	CURSOR (kev)	CURSOR COUNTS	CURSOR CPM
● 1	561 to 760	4007	4007	661	148	148

Clean up waste

Thyroid Probe

## Spectrum Analysis Report



Spectrum acquired on Tuesday, March 03, 2009 at 04:25 PM

### Counting Parameters

Isotope: Cs-137

Detector: Probe

Gain: 2

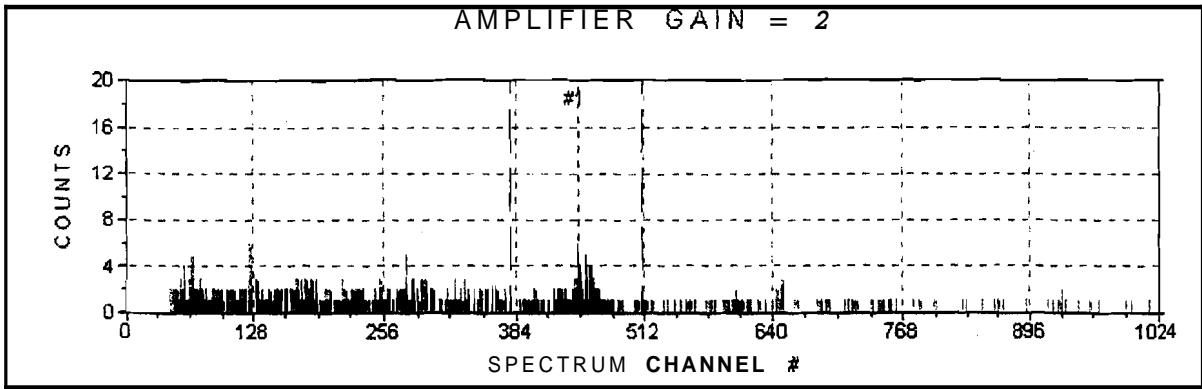
Count Time (sec): 60

### ROI Statistics

ROI #	ROI (kev)	ROI COUNTS	ROI CPM	CURSOR (kev)	CURSOR COUNTS	CURSOR CPM
● 1	561 to 760	157	157	650	5	5

3/3/09  
 Signal Wire  
 (Thyristor)  
 Probe

## Spectrum Analysis Report



Spectrum acquired on Tuesday, March 03, 2009 at 04:29 PM

### Counting Parameters

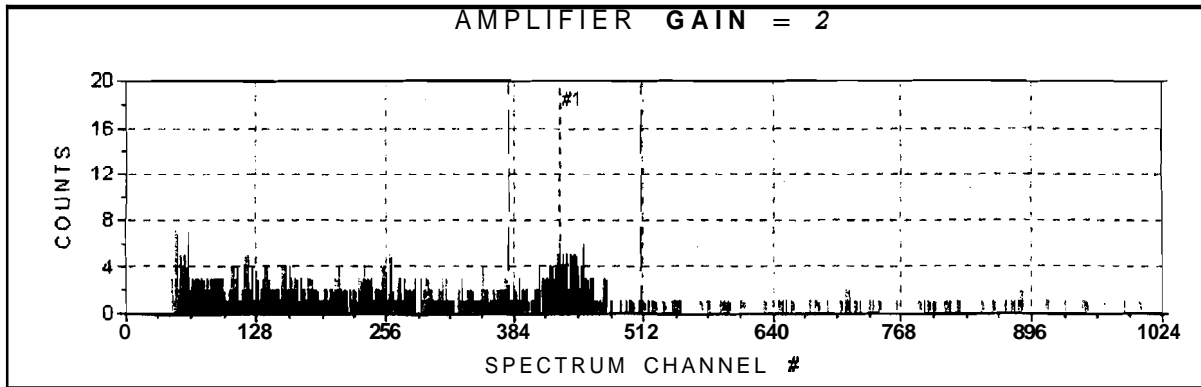
Isotope:	Cs-137	Detector:	Probe
Gain:	2	Count Time (sec):	60

### ROI Statistics

ROI #	ROI (keV)	ROI COUNTS	ROI CPM	CURSOR (keV)	CURSOR COUNTS	CURSOR CPM
● 1	561 to 760	98	98	663	6	6

Pb Pipe

## Spectrum Analysis Report



Spectrum acquired on iuesdav. March 03.2009 at 04:42 PM

### Countina Parameters

isotope: Cs-137                      Detector: Probe  
Gain: 2                                      Count Time (sec): 60

### ROI Statistics

ROI #	ROI (kev)	ROI COUNTS	ROI CPM	CURSOR (kev)	CURSOR COUNTS	CURSOR CPM
● 1	561 to 760	177	177	638	6	6

03-Mar-09

Instrument: BNC MCA model 6989 sn 44.103 3x3 inch NaI(Tl)

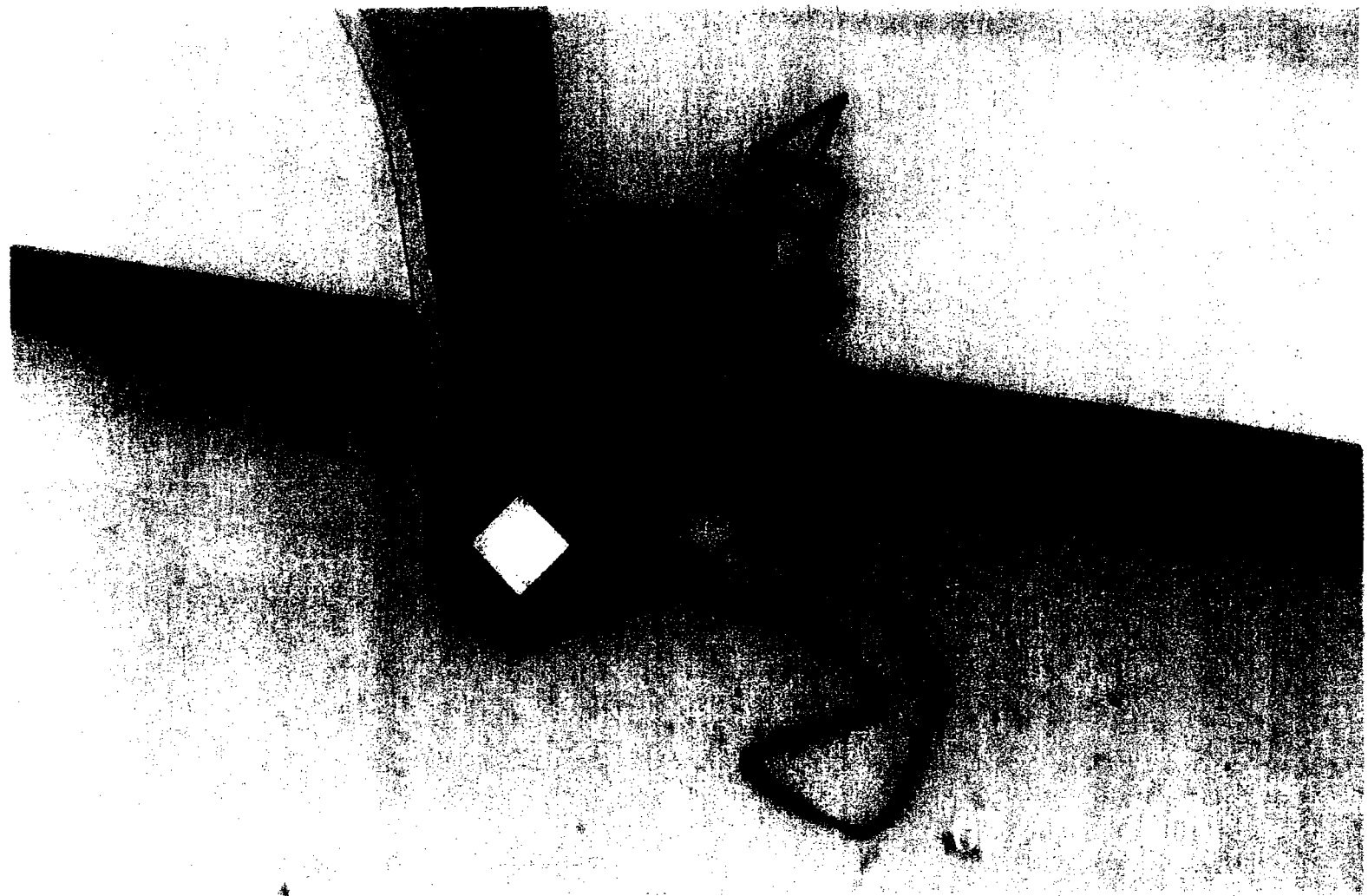
Report by: Michael Taylor, RSO

The purpose of this report is to document the contamination levels of the physics port as the result of the leaking Cesium 137 check source as discovered on 8 January 2009.

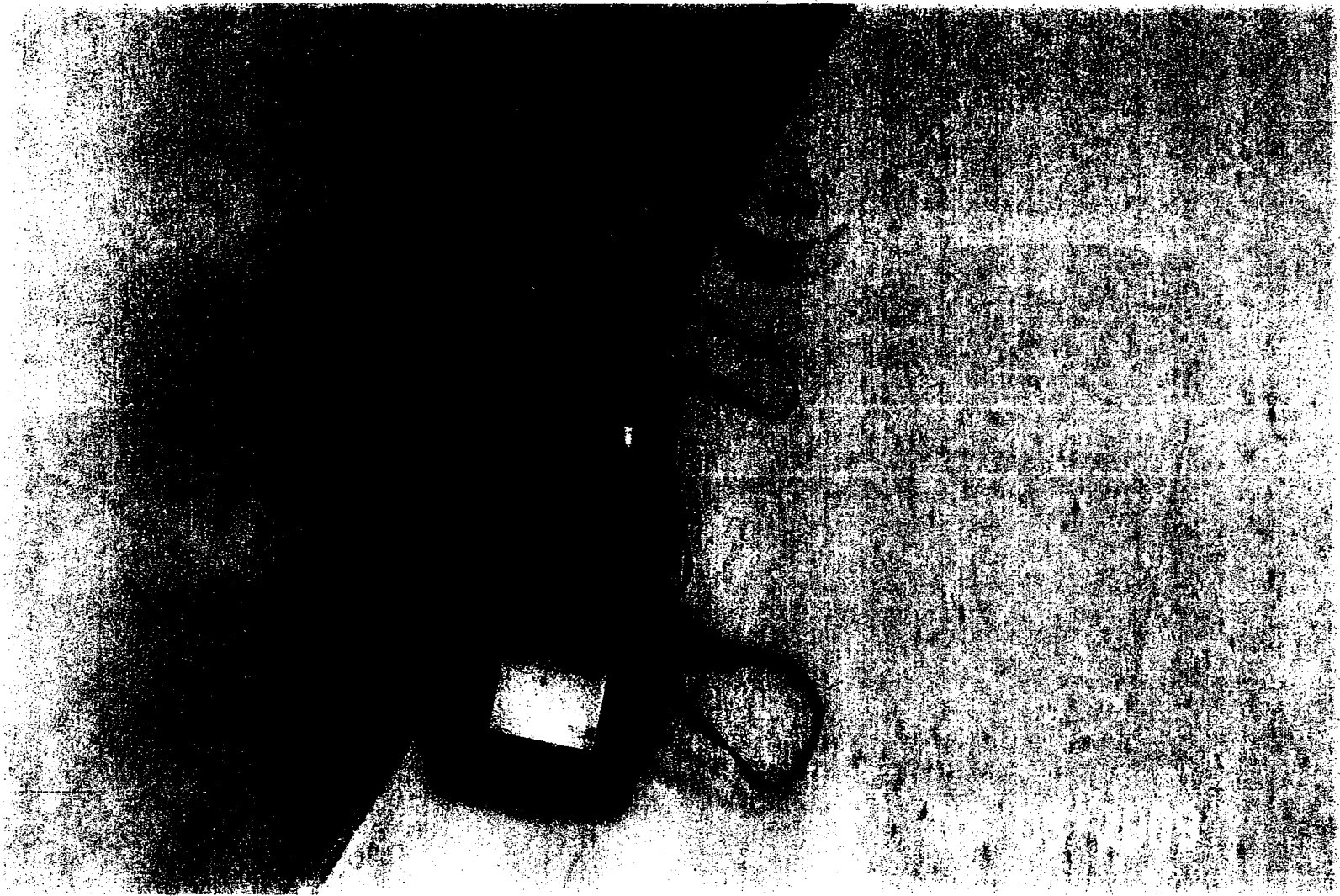
**Counter evaluation based on MCA results** with the probe in direct contact with target

10 uCi Cs137 button source calibrated 1Feb00	Background	Corrected count	Activity To Date	Activity per count uCi/CPS	Measured one minute count	Corrected count	Activity uCi
CPS	CPS						
54385.6	129.4	54256.2	8.117	0.00015			
Physics port entrance, control room					148.4	19	0.003
Physics port entrance, patient room					159.9	30.5	0.005

Exposure Rate	uRem per hour
Background	4.1
Physics port entrance, control room	4.6
Physics port entrance, patient room	4.28



BNL MCA  
HDB control physics Dept entrance



RNIC MCA

HDR Patient Assoc. Post Card





Attachment 6

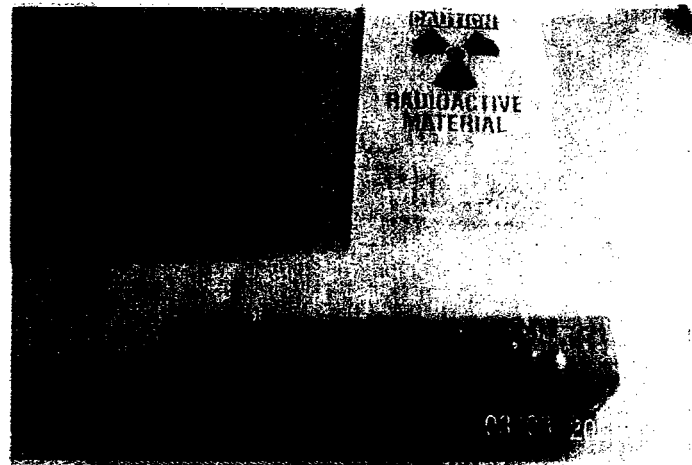
Cs-137  
90 uCi  
unknown date  
unknown manufacturer

Attachment 4



01/08/2008

check source after epoxy coating



# Memorandum for the Record:

February 12, 2009

Subj: Cs-137 Decontamination in HDR Room

## 1. Background:

a. On December 29, 2008 the sink and sump flooded the floor of the HDR Control Area and the Physics Cable Pass-through Tube to the HDR room. A Cs-137 check source of approximately 45-90 micro-curies (approximately 90 when new, now decayed to approximately 45 micro-curies) was stored in the Tube and became soaked. The Control room floor was cleaned up when the flooding was discovered but the flooded Pass-through tube was not discovered until several weeks later. When it was discovered, it was also discovered that the water had degraded the encapsulation of the source and the source had leaked. The water and the surface of the Tube were mildly contaminated with Cs-137.

b. The water was removed and a preliminary decontamination of the tube was performed. Pending further evaluation, the openings to the tube were closed with radioactive material warning tape over the openings and the opening in the treatment room covered with Lucite to prevent entry. The opening in the HDR Control area was left open to the atmosphere to allow the tube to dry.

c. Spectroscopic assay confirmed the presence of Cs-137. Investigation of the source indicated the initial activity was about 90 micro-curies when manufactured in approximately 1970.

## 2. Decontamination of the Tube:

### a. Equipment and Material:

- (1) Plastic backed laboratory bench top absorbent paper
- (2) Cleaning solvent, "409 All Purpose Cleaner"
- (3) Paper towels
- (4) Waste Container
- (5) Masking tape
- (6) Protective gloves
- (7) Scraper (stubby screw-driver)
- (8) Toothbrush
- (9) Ludlum Model 3 Survey Meter with GM-Frisker probe.

### b. Method:

- (1) The floor and tube were frisked to establish the "background" or initial activity levels. The floor was determined to not be contaminated.

Ludlum Readings taken ½ inch from surface

Floor 1	Floor 2	Floor 3	Floor 4	Floor 5	Tube HDR Room	Tube Control Rm
20 cpm	20 cpm	20 cpm	25 cpm	25 cpm	1,200 cpm	20 cpm

Note: Locations Floor 4 and 5 were closest to the HDR unit which was in the room.

Attachment 7

- (2) The laboratory absorbent paper was cut to allow access to the tube and taped to the floor to minimize potential cross contamination of the floor.
- (3) The tube was sprayed with “409” and **wiped/scrubbed** with paper towels. Old wax and dirt was scrapped loose with the stubby screwdriver and wiped up. The waste was frisked as it was removed. Periodically the area was frisked to determine if the contamination levels were being reduced. As the contamination levels reduced, lead sheet was wrapped on the backside of the detector to provide some directional indication while frisking within the tube.
- (4) At the conclusion of this effort, all tools and materials were frisked, floor was frisked, hands, feet, etc.

c. Results:

Floor 1	Floor 2	Floor 3	Floor 4	Floor 5	Tube HDR Room	Tube Control Room
20 cpm	20 cpm	20 cpm	25 cpm	25 cpm	250 cpm	20 cpm

Top, Inside Tube Control Room	Bottom, Inside Tube, Control Room	Top Back, Inside Tube, HDR Room	Bottom, Inside Tube, HDR Room	Top Front, Inside Tube, HDR Room
20 cpm	20 cpm	250 cpm	150 cpm	450 cpm

- (1) There appears to be a small amount of residual contamination in a groove between sections of the PVC piping that makes up the walls of the pass-through tube. The contamination appears to be at about the 4-5:00 o'clock location in the groove or in a saw cut in the piping at about the 6:00 o'clock location.
- (2) Further decontamination was postponed to allow procurement of a stiffer brush and fabrication of a better shield to give a more directional detector.

J. D. George

February 13,2009

Decontamination Continued:

1. A stiffer brush was added to the previous material to decontaminate the tube. Additional lead was added to the detector to make it more directional. The Ludlum Model 3 was being used elsewhere so a Ludlum Model 14C with a GM frisker detector was substituted.
2. A more detailed survey indicated the contamination was in the area of a groove between sections of the PVC piping as described earlier. The bottom of the tube and the portion that exited under the control panel were not contaminated.
3. Paper towels were placed in the bottom of the tube to catch any liquid run-off before it could reach a PVC junction groove in the bottom of the tube. Cleaner, "409", was sprayed onto the area of the contaminated groove, the area scrubbed (5-15 minutes) with the stiffer bristle brush and then the area was wiped dry with paper towels. The towels were placed in the waste bag and the area frisked. The results of the frisking are provided below:

Initial Survey:

Floor 1	Floor 2	Floor3	Floor 4	Floor 5	Tube HDR Room	Tube Control Room
20 cpm	20 cpm	20 cpm	25 cpm	25 cpm	250 cpm	20' cpm

Top,Inside Tube Control Room	Bottom, Inside Tube, Control Room	Top Back, Inside Tube, HDR Room	Bottom, Inside Tube, HDR Room	Top Front, Inside Tube, HDR Room
20 cpm	20 cpm	250 cpm	150 cpm	450 cpm

1st Decontamination

Floor 1	Floor 2	Floor 3	Floor 4	Floor 5	Tube HDR Room	Tube Control Room
20 cpm	20 cpm	20 cpm	25 cpm	25 cpm		20 cpm

Top,Inside Tube Control Room	Bottom, Inside Tube, Control Room	Top Back, Inside Tube, HDR Room	Bottom, Inside Tube, HDR Room	Top Front, Inside Tube, HDR Room
20 cpm		200 cpm		300-450 cpm

2<sup>nd</sup> Decontamination

Floor 1	Floor 2	Floor 3	Floor 4	Floor 5	Tube HDR Room	Tube Control Room
20 cpm	20 cpm	20 cpm	25 cpm	75 cpm		20 cpm

Top, Inside Tube Control Room	Bottom, Inside Tube, Control Room	Top Back, Inside Tube, HDR Room	Bottom, Inside Tube, HDR Room	Top Front, Inside Tube, HDR Room
20 cpm	20 cpm	100 cpm		200 cpm

3<sup>rd</sup> Decontamination

Floor 1	Floor 2	Floor 3	Floor 4	Floor 5	Tube HDR Room	Tube Control Room
20 cpm	20 cpm	20 cpm	25 cpm	25 cpm		20 cpm

Top, Inside Tube Control Room	Bottom, Inside Tube, Control Room	Top Back, Inside Tube, HDR Room	Bottom, Inside Tube, HDR Room	Top Front, Inside Tube, HDR Room
20 cpm	20 cpm	80 cpm	25 cpm	180 cpm

4<sup>th</sup> Decontamination

Floor 1	Floor 2	Floor 3	Floor 4	Floor 5	Tube HDR Room	Tube Control Room
20 cpm	20 cpm	20 cpm	25 cpm	25 cpm		

Top, Inside Tube Control Room	Bottom, Inside Tube, Control Room	Top Back, Inside Tube, HDR Room	Bottom, Inside Tube, HDR Room	Top Front, Inside Tube, HDR Room
20 cpm	20 cpm	20 cpm	20 cpm	80 cpm

5<sup>th</sup> Decontamination

Floor 1	Floor 2	Floor 3	Floor 4	Floor 5	Tube HDR Room	Tube Control Room
20 cpm	20 cpm	20 cpm	25 cpm	20 cpm	20 cpm	20 cpm

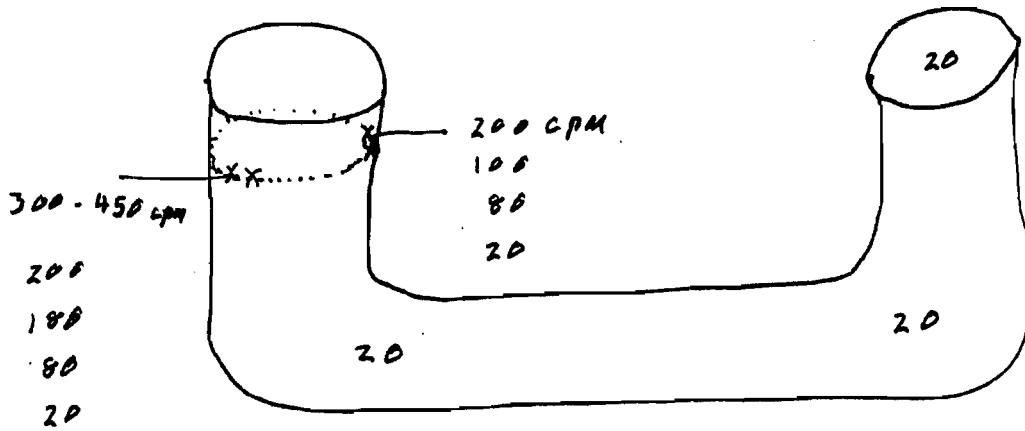
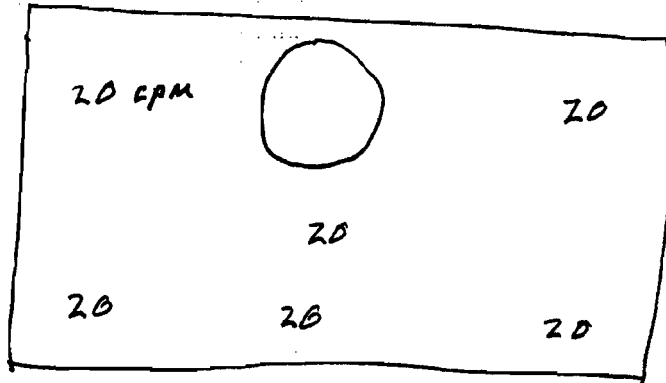
Top, Inside Tube Control Room	Bottom, Inside Tube, Control Room	Top Back, Inside Tube, HDR Room	Bottom, Inside Tube, HDR Room	Top Front, Inside Tube, HDR Room
20 cpm	20 cpm	20 cpm	20 cpm	30 cpm

4. Since the residual is less than twice background the tube was released from further radiological controls.

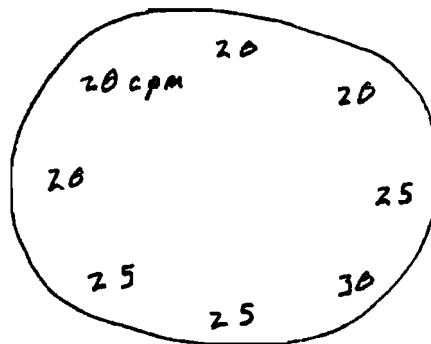
*J. A. George*

2-13-2009

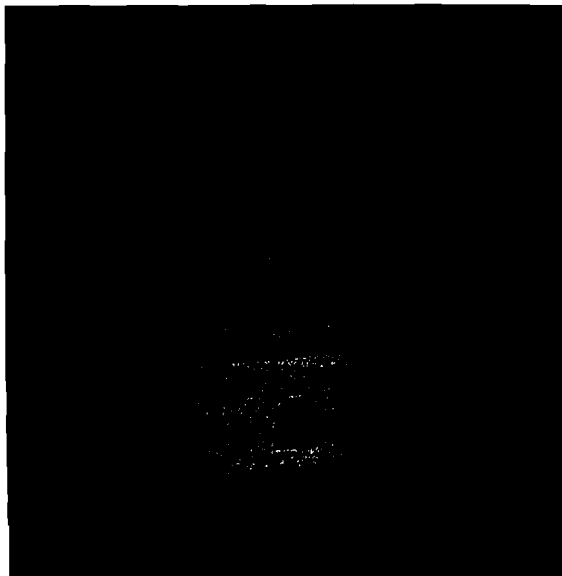
HDR Room



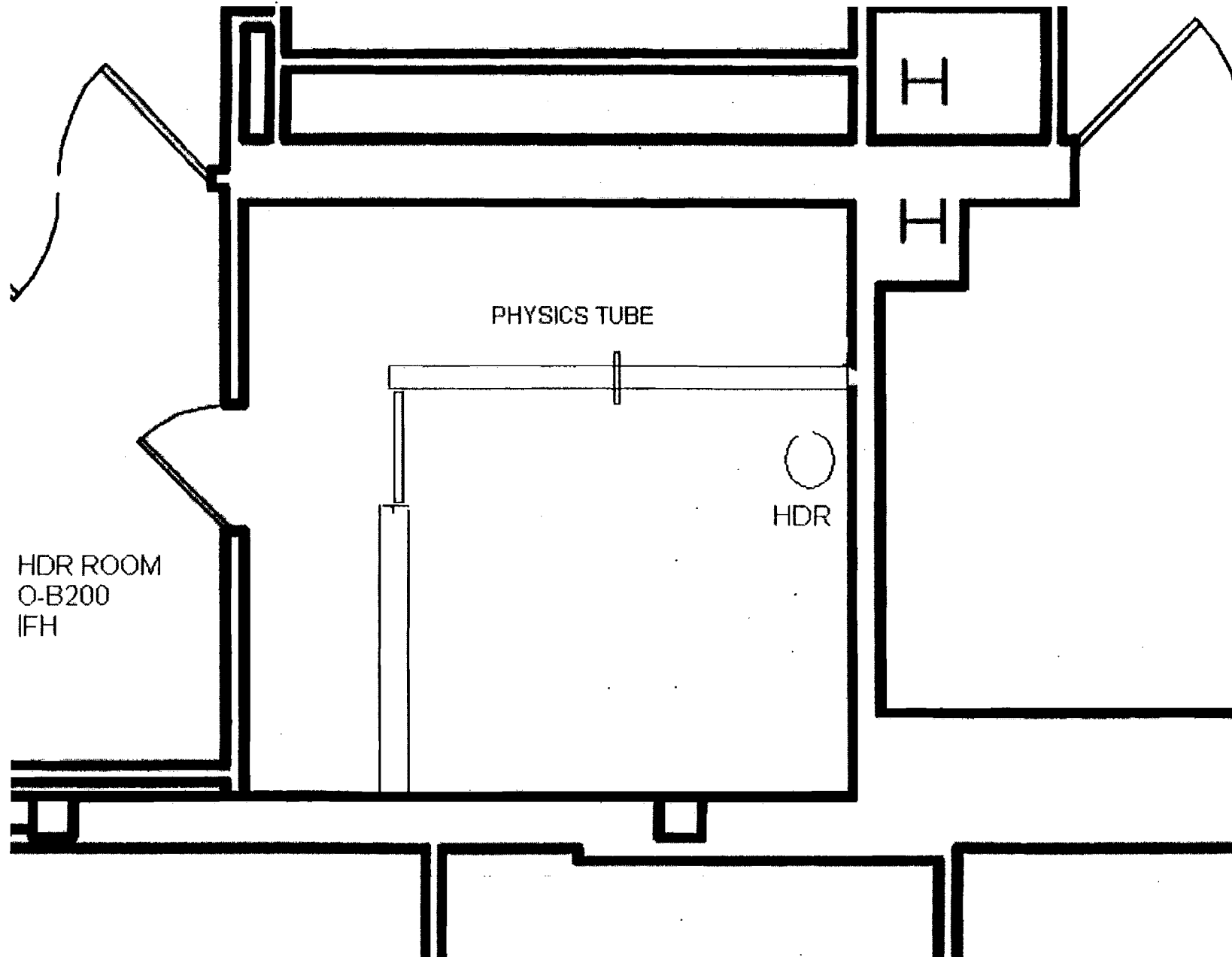
Final Survey







HDR Physics Tube  
FEB 2009  
Decontamination



HDR ROOM  
O-B200  
IFH

PHYSICS TUBE

HDR

H

H

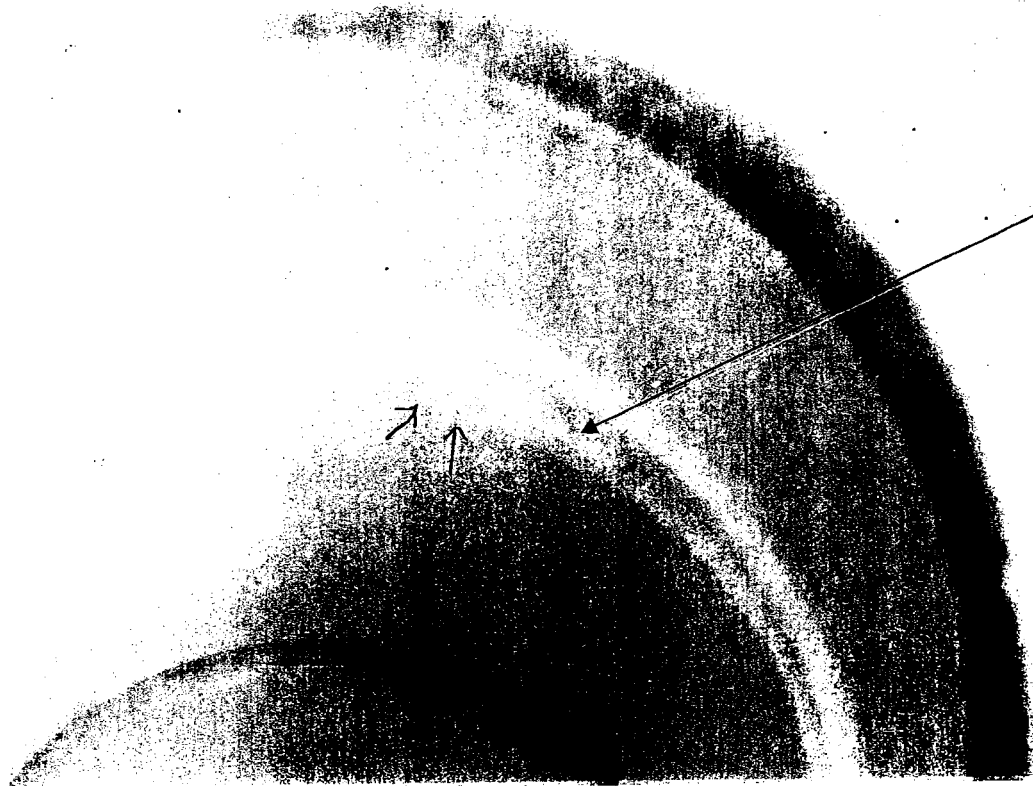
CONFIDENTIAL

9 Jan 04

Extent  
of

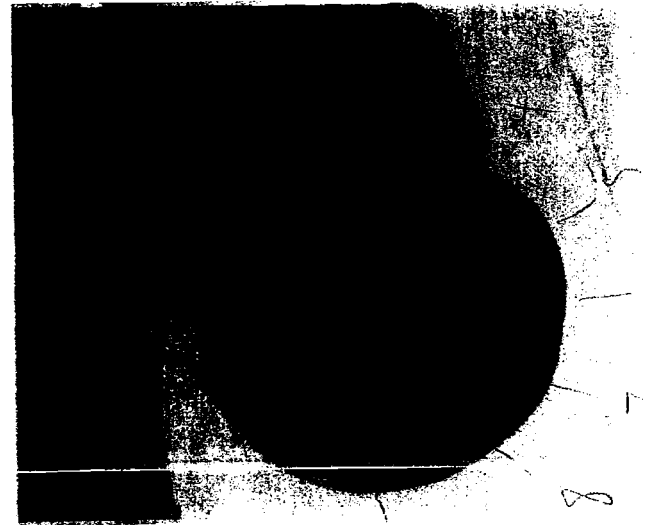
Contaminated  
Post  
Discovery

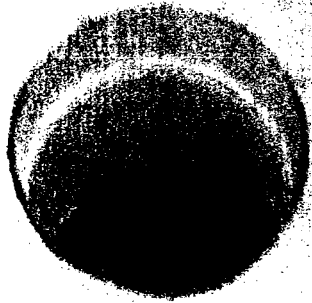
to  
ADR  
Patient  
Room



Cut in PVC pipe

HDR Room  
Physics Lab



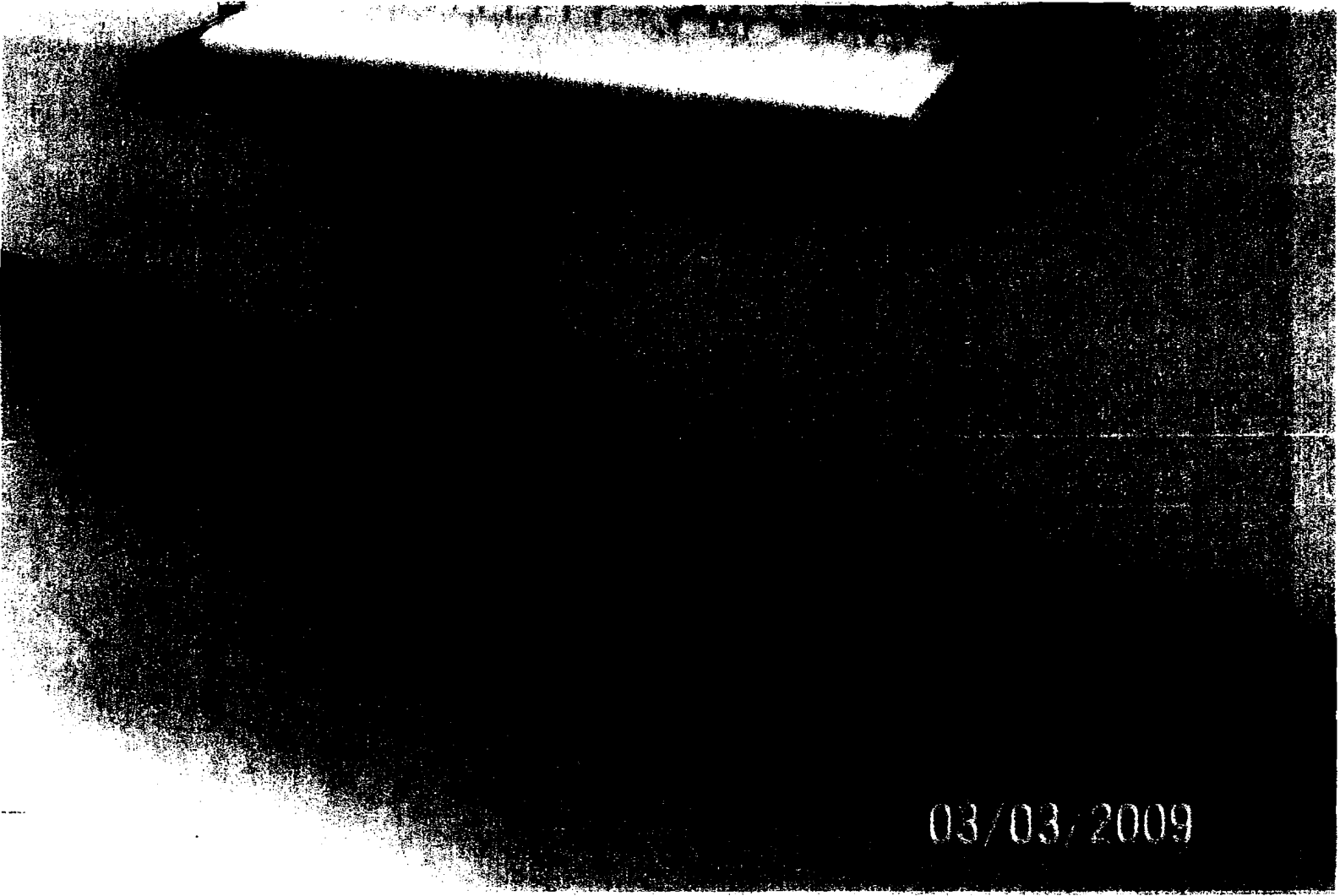


Physical Port



CRP

HDR Patient Room  
Showing Physical Port



HBR Control Room  
Showing physics part