

“Leaking” Cs-137 Sources

**GammaCell 40 Self Shielded
Irradiator, Serial No. 20**

**AECL-161 sources manufactured
by ORNL
Serial Nos. Cs-96 & Cs-97
3582 Curies on 11/26/75**

Gamma Cell 40 units in USA



Total of 129 units in 30 states

65 units in 22 states have the ORNL sources

November 3, 2009

Best Theratronics servicing the unit
Coincidentally DOH Staff on site

Noon - DOH staff arrive in lobby

Noon - RSO reports event to DOH main office

12:05PM DOH office notifies DOH inspectors

12:15 RSO meets DOH staff in lobby

Servicing Procedure

Non-routine

Special procedure - requires removal of pneumatic drive cylinders and end caps to the source drives.

These components are not normally removed for routine preventative maintenance.

Indications of a problem

Lower drive source rod/assembly moved slower than the upper unit w/pneumatic drive

Service Engineers noted corrosion (rust) on both upper & lower source drive end caps

Excessive resistance to manually move the lower source rod and corrosion was noted

Assessment

Corroded items were “wiped” with cloth material and screened with a thin-window GM probe coupled to a rate-meter

Further analysis indentified the materal as Cs-137 in excess of 5nCi per sample

Actions Taken

Persons, room and equipment/tools surveyed

Contaminated items bagged and labeled

Servicing procedure was halted

Unit reassembled

Unit removed from service

Register sources with OSRP

DOH Notice to Licensees

Issued November 23, 2009

Apprise GC-40 licensees and Irradiator
Service Licensees of the occurrence

Recommend that older units be inspected by
licensed service provider

Best Theratronics Safety Bulletin

Issued on December 2, 2009

Advise licensee of potential hazard of Cs-137 contamination during servicing

Tell licensees that users can continue to safely use the units under normal operating conditions

Caution needed for service that requires dismantling.

Leak Test Requirements

6 months - method capable of detecting 0.005uCi

For teletherapy and/or irradiator sources, the selected accessible surfaces should be those surfaces on which one might expect contamination (if there were to be leakage) to accumulate

If there is reason to suspect that a sealed source might have been damaged, or might be leaking, such source shall be tested for leakage before further use.

Reporting Requirements

Reports of leaking or contaminated sealed sources. If a sealed source is determined to be **leaking or contaminated**, a report shall be filed within five days with the Department describing the equipment involved, the test results and the corrective action taken.

Requirement - disposition of a leaking source

Detection of a leak in any sealed source in excess of the sensitivity levels set forth in this paragraph shall result in immediate suspension in the use of such source until such source is decontaminated and repaired or disposed of in accordance with section 16.8 of this Part.





History of Leaking Sources

Is a leaking Cs-137 source a rare occurrence?

Is a contaminated Cs-137 source a rare occurrence

SS&D

PROTOTYPE TESTING:

The Gammacell 40 has been in use since 1971 without any reported incidences. The manufacturer claims that a full program of prototype tests sufficient to establish that the safety features of the device will continue to function properly under the most adverse conditions was conducted.

The manufacturer claims that the C-440 sources have been tested to ANSI N542-1977 and achieved a classification of E65546.

Southwest Research Institute

Is a subcontractor to GTRI/OSRP program and has 50 years dealing with sources

SwRI has experienced many contaminated (leaching) but very few leaking sources

SwRI's findings

Nearly 3000 sources received

6 were confirmed leakers.

25-50% displayed contamination on the source, the inside of the device containing the source, or both, some exceeding 0.005 uCi per leak test sample

Contaminated Cs-137 Sources

Sources can become contaminated during the manufacturing process - highly likely

Handling with manipulators

Volatilization of Cs during welding - trapping Cs in weld area

Leaches or difuses from pores or bubbles in the weld area thus appears to be leaking

Leaking vs Leaching

Leaking - a breach in the source capsule creating a path from the inside to the outside

Leaching is contamination moving from porous areas in the source weld to the surface

Confirming Leaking Sources

Visual hole or crack in the capsule

Physical damage

Failing a helium-leak test

Repeated wipes over time wipes show an increase in activity

Combination of the above

NRC Information Notice is in the final stages of publication (DRAFT)

- NRC determined that these devices can continue to be used safely in normal use, maintenance and leak testing processes
- Non-routine maintenance should be performed only by qualified personnel following specialized procedures and, if dismantling is planned, licensees should contact the manufacturer for guidance
- NRC initiated a study of the leaching phenomenon that might have been the root cause of the Gammacell 40 contamination and will notify licensees as further information becomes available

Issues

Are the DOH licensee's sources leaking or contaminated?

Could it be safely put back into service?

Affect on research projects

How much contamination is acceptable?

How does contamination leaching from a weld move to the source drive caps?

Changes to SS&D reviews or terms of use?

Change the leak test/contamination criteria?

Does this occurrence support replacement of CsCl-137 irradiators?